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ABSTRACT

This report by the Schools Council Project in England examines questions and responses of children aged 8-16, and in particular, the role that curiosity and questions can play in learning. Chapter 1 compares comments of various government-sponsored reports. The second chapter reviews ideas and evidence about both curiosity and questions and the link between them. Chapter 3 analyzes the linking between perceived value, relevance, and surprisingness, via interest, to the amount of questioning. Chapter 4 looks at a number of problems outside the constraints of traditional classroom experimentation. While the fifth chapter yields a clear picture of social class differences in reported boredom, chapter 6 does not yield a similar result for questions, and reasons for this are discussed. Chapter 7 reports the findings of social class differences in the efficiency with which individual questions are posed by 7- to 10-year-old children. These findings are analyzed in relation to the discovery that this same social class difference was not obtained with middle and working class adolescents. Chapter 8 looks at factors associated with the selection of persons to whom questions can be posed. Chapter 9 poses two basic problems: Does the posing of questions in fact facilitate learning? Will the teacher's questions encourage learning as much as the pupil's own questions? Chapter 10 provides an overview and discussion. (CS)

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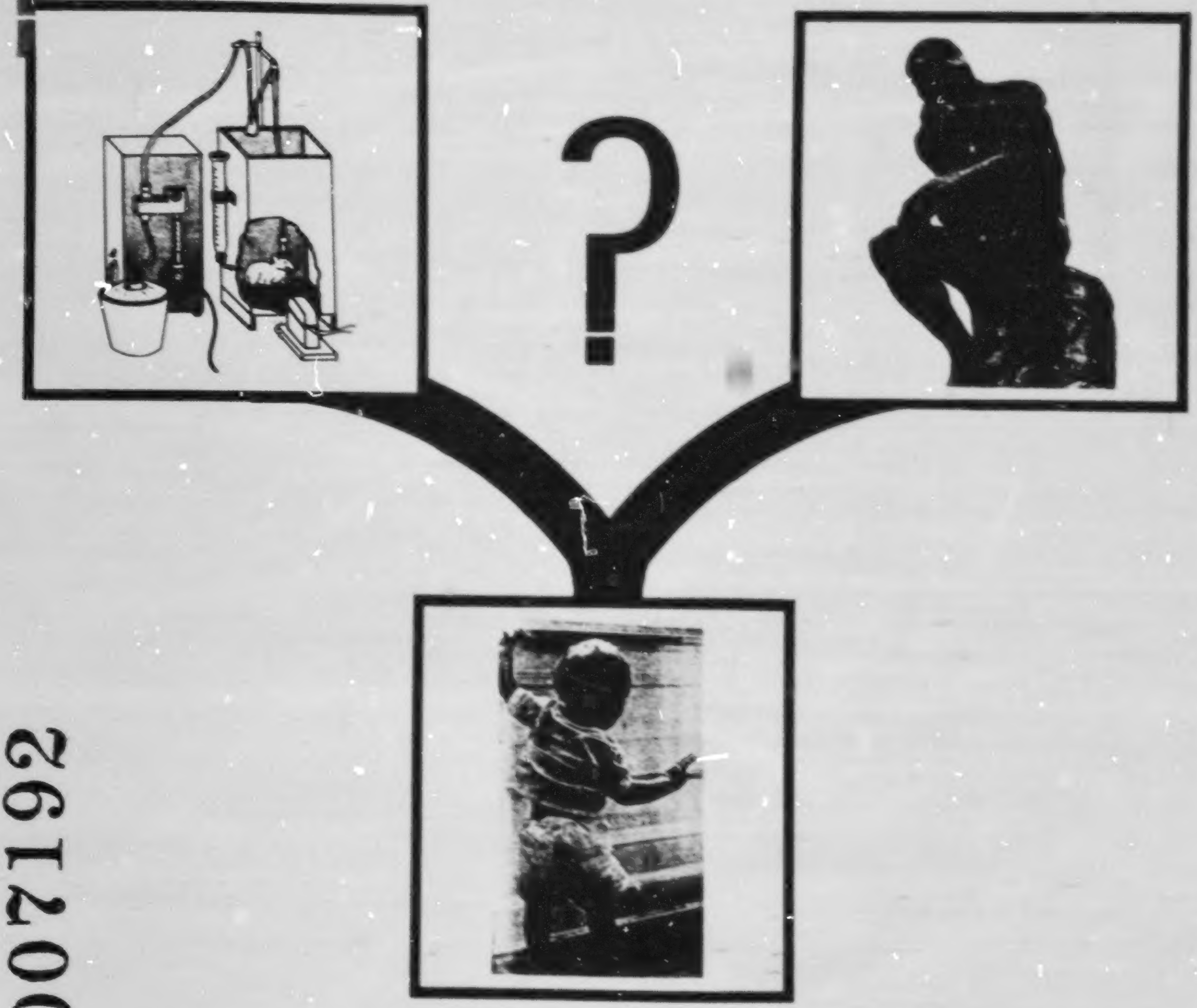

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Schools Council Project: **Questions and Responses of Eight to Sixteen Year Old Children**

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EDUCATION, CURIOSITY AND QUESTIONING

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Project Director.

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INTRODUCTION (W.P. ROBINSON)

The projects supported by grants from the Schools Council are both numerous and diverse. Some aim to summarise the current state of knowledge and expertise, others to explore new ideas. Collections of research findings co-exist with documentation of existing practice and bibliographies. Refinements and elaborations of materials and techniques rub shoulders with exposures of problems of policy and organisation. So far, the Council has resisted the temptation to indulge itself in a little narcissistic categorisation of its own projects. Hence we are left to choose our own niche. We would locate our activities as long-term general research. We have created no ingenious sets of coloured plasticine balls for teaching conservation, we have no proposals for a C.S.E. syllabus in philosophy, and no comments to make on the planning of the layout of classrooms.

To dare to label one's activities as 'long-term general research' is to invite adverse criticism. To claim to be general rather than particular, abstract rather than concrete and to adopt a twenty year rather than twenty day time perspective provokes the irritated challenge from the Friday-weary teacher, 'But how does this help me here and now with this class and with this problem?'. We can quickly abandon scholarly caution and reply that we do not pretend to offer such help, although hopefully other projects that come after this one and are helped by it, will.

This is not the place to offer a long justification of our research, although some defence is necessary in a climate of national opinion that seems to have shifted towards demands for immediate applicability. People expect leeks to take a year to grow, they expect oak trees to take longer. They see nothing odd about planting trees for future generations. But 'long-term general research' they are likely to view as theoretical woffle. The more we know about child development in general, the better we can gear teaching to what children are like. We all have implicit theories about human nature and about the development of children. The sooner we are all much better informed about such matters and have theories and beliefs that correspond to the facts, the better our educational system can be.

We have no wish to retreat into the paint-spattered ivory towers of a university and mutter disdainfully about the purity of pure research, defensively asserting that applications and value-judgements are irrelevant to the enterprise. We are quite happy to mention three of the many value-judgements underlying the work.

One has already been mentioned : knowledge is preferable to ignorance – even if it is not true that 'the truth shall make you free' ignorance ensures captivity and impotence. While it is true that knowledge can be exploited for good or evil, ignorance about ends and means will render the attainments of good outcomes unlikely. If we subscribe to the view that one of the aims of education is to transmit knowledge as efficiently as possible to all future members of the society, the more we find out about the necessary and sufficient conditions for optimal learning, the more efficient the educational system can be. We need to understand how children learn and not just accept that they do. We need to know about the consequences for the learner of different types of learning. We can only take sensible decisions about content, materials and contexts, if we can match these to the characteristics of the learner. It is upon these characteristics that we focus attention. In particular we ask about the role that curiosity and questions can play in this learning.

About the learner we make two further value-judgements; that, other things being equal, it is preferable to rely on intrinsic rather than extrinsic sources of motivation, and that it is better to err on the side of having faith in the capacities of children to learn than it is to underestimate them. Both points need elaboration.

To assert that, ceteris paribus, it is better to rely on intrinsic rather than extrinsic sources of motivation for learning may appear to be a strange as well as an incomprehensible value to mention. Put more crudely the proposal is that children should learn because they want to know, not because they will be rewarded with praise, smiles and presents, and not because they will be punished with red crosses, shrugged shoulders or rejection if they do not. As we shall see later, especially in Chapter 2, a distinction is drawn between response-based and intrinsically motivated learning. 'Response-based learning' refers to the acquisition of correct responses, where 'correct' means maximising rewards and minimizing punishments in whatever overt or covert guise these may exist. When the focus of the learner shifts from getting correct answers because he wants to know and to understand, to watching out for what pleases or displeases teachers, parents and peers in the hope that he will receive smiles, wrath, tape-recorders, extra money, a better job or more deference, then the crucial relationship between what he says and reality and the appreciation of this relationship is in danger of relegation to a secondary significance only. In so far as we reward 'correct' responses and punish 'incorrect' ones without regard to the learner's understanding, we are luring him away from achieving constructions of reality corresponding to the real world into an unnecessary conformity and a temptation to concentrate upon the manipulation of the social system. And this, alas, we do, and in no uncertain terms! For the majority of the population, entry to jobs is geared to educational qualifications, with the more prestigious, secure, and better-paid jobs being the rewards of those with higher levels of certification. Pupils in both secondary and tertiary sectors of education are aware of the 'rules of the game': find out what the teachers/examiners want and put that down. Interest and commitment to topics can be an irritating hindrance when there is a long syllabus to cover! The notion that universities encourage independent and creative thinking is a myth that needs to be checked against reality. Do students see things that way? If it is true, that the apex of the education system is heavily committed to demands that students sponge up predigested opinions, then it would not be surprising to find the same rules operating down through the secondary schools. If the examinations in higher education and national qualifications are indeed saturated with response-based learning, this is, of course, no indictment of examinations as such, only of examinations taught for and marked in certain ways. Neither is it appropriate to draw the impossible, absurd, and inhuman inference that teachers should try to eliminate all rewarding and punishing from their interactions with pupils. What it does mean is that we need to check constantly that children are understanding what they are doing and saying, and that they are not learning primarily to please us or to gain other rewards. Furthermore, we need to create teaching situations where this can be true without cost to either pupils or teachers. Neither are we suggesting that response-based learning is undesirable in all situations for all learning problems. As chapter 2 reveals, Piaget is given a lead role in the production of our play. At present his is the best critical description of the sequence (and content) of the intellectual development of children. His story not only describes what children *can* do, it also attempts to specify what internal structures (operations) a child must have in order to achieve what he manages to do. It is, however, a model of competence: what children can come to manage if they have interacted sufficiently with an environment upon which they have been able to act and generate the conflicts whose resolution constitutes intellectual development. Properly nurtured and cared for, the child is an active, self-motivated acquirer of knowledge and needs no inducements to facilitate basic intellectual development. Not all learning, however, involves the acquisition of those fundamental concepts and principles and their application in problem-solving that are Piaget's main concern. Children also have to learn masses of information that involves no new understanding. The learning of the lexicon and grammar of a foreign language may involve the understanding of no or only a few new ideas and principles, but simply the assimilation of large numbers of units, structures, and rules for their combination and use. Appropriately organised rote learning, in conjunction with practice in production and knowledge of results, is likely to lead to much faster and efficient learning than 'guided discovery' – given that the learner wants to learn the language. The same will be true of the detail of much of what is to be learned in school, although again, wanting to learn can be made independent of the reinforcement contingencies. However, incentives applied to these learning tasks are unlikely to lead recitals of uncomprehended materials. Observing teachers and others actually enjoying some constructive use of their knowledge may likewise serve as an incentive without an undue corruption of understanding.

Albeit the value-judgement remains. Where the attainment of rewards and the avoidance of punishments become the focus of attention, much important learning is likely to become meaningless. Wanting to learn appears to be an inbuilt characteristic of our species, and it is silly to waste this attribute.

Unfortunately, the general move towards the use of 'guided discovery' in recent years probably took place too quickly. 'Piaget' has come to be a hated name to many of a generation of young teachers forced to learn his stages by rote, while 'guided discovery' must now be synonymous with 'playing about' for many teachers and parents. We prepared neither teachers nor parents for the change. Along with the inevitable misunderstandings consequent upon the general human tendency to assimilate, simplify and distort the complex, there was a rush into a polarisation of extreme protagonists and antagonists.

The recent acceleration in the enthusiasm for espousing a Piagetian approach to child development is borne of complex motives. As the assessment of government-sponsored reports in chapter 1 shows, the Hadow report of the 1920's was writing about the advantages of harnessing the natural curiosity of children. And we have also become aware of the transience of much theoretical and factual knowledge in science and technology. While we might agree about the necessity of teaching some of the basic skills to be imparted to children and we would note that much knowledge is durable, we have also come to realise the value of educating children to be general problem-solvers rather than mines of obsolete information. Flexibility and the ability to assimilate rapid changes have become essential ingredients in the make-up of technologists in an era of rapid change. And there is a tempting similarity between the characteristics of 'the general problem-solver' and those of Piagetian man that does not obtain with other theories of child development. If this concern is justified, then we need to find out how to train general problem-solvers, and this involves an understanding of questioning skills and curiosity.

The second value-judgement about the characteristics of the learner was expressed as a preference for making one kind of error rather than another. We can decide that a child is not capable of learning when he is; we can decide he is capable when he is not. In practice we have to assign priorities to our teaching endeavours; we cannot spend unlimited time and resources on one child at the cost of neglecting others. We may also deem it cruel and wrong to try to push individual children beyond their limits. However, if we pretend that the present standards obtained by school-leavers reflect the potential of an age group, we may be making a very serious error; that it is an error shared with a number of eminent educators and psychologists does not reduce the seriousness.

Both Jensen (1968) and Eysenck (1971) have interpreted the differential IQ scores of Negro and white and working and middle class children in terms of a heavy differential genetic endowment of intellectual functioning. Both have gone on to offer comments about the education of these groups. While the general premiss about the genetic basis of individual differences in intellectual capacity is one which many who have worked in the area and studied the literature may well feel obliged to share, comments about the possibility of a measure of intellectual inferiority in Negro and working class children are arrived at via some strange reasoning. If we ignore the methodological inadequacies of the studies reported and the illegitimacy of the generalisations to the general population, we can still argue that their failure to specify the relationships between IQ scores and the concept of 'intelligence', their assumptions about the relationships between IQ scores and what can be learned, and their blindness to the relevance of social psychology, sociology and a dash of history to children's development, has led them into a premature and unjustified 'provisional' sympathy with the hypothesis of inferiority. While it is easy to agree with the tenor of Eysenck's prediction that 'we will not succeed in changing human nature by refusing to face facts' (1971, *p.* 140) we must also remember that our present beliefs may be ill-founded. Eysenck's writing is particularly pernicious because it is readable, clear and has an air of scientific detachment and an apparent willingness to concede the provisional nature of the conclusions. However, the inability to shift perspective, the distortion of evidence and the occasional wild and dogmatic inaccuracy severally suggest an authoritarian rather than an authoritative approach to the problems discussed.

Unable pro tem to accept such a view of working class children, it is upon their condition that we have focused attention. They are the losers in the educational system on a wide variety of indices of achievement. Bernstein (1961, 1971) has developed a thesis attempting to explain part of the reason why working class children fail at school, and accumulated evidence is consistent with his pronouncements about differences in language use. It is difficult to see how we could disagree with the proposition that an adequate mastery of the representational function of language use and its units and structures is a necessary condition of educational success — and the evidence is that working class children are relatively deficient in this skill (see Robinson, 1972). The gambler's rule is to stay with a winning number, and there seemed to be no good reason to desert Bernstein's theoretical framework, and so we retained it.

In chapter 1, we collate and compare the comments of various government-sponsored reports in order to set the work in its historical and contemporary social context. We note the overt commitment to an enthusiasm for extending and encouraging the curiosity of children, but record the disparity between the sanguinity of the tone of reports on primary schools and the melancholy of those about the secondary sector. We are puzzled by this discontinutiy. How can Plowden's cheerful zealot become Morton-Williams' inert misery? Parenthetically, it is worth mentioning that recent reports have come to rely on sensibly collected evidence from all parties concerned rather than upon the uncorroborated opinions of 'experts'.

To set the work in the context of psychological research, we review, in chapter 2, ideas and evidence about both curiosity and questions and the link between them. What arouses curiosity and how does curiosity relate to learning? How can questions be used to facilitate learning? Towards the end of the first half of the chapter we are forced to admit the incompleteness of the picture, but put forward a weak attempt at completion. In the second part of chapter 2 we attempt to articulate the cognitive developmental and reinforcement principle approaches to children's learning and to fit curiosity, boredom, and questions into the synthesis. We apply the analysis, in conjunction with Bernstein's ideas, to the problems of working and middle class children and set out our expectations about differences that might obtain, in empirical investigations. We wished to check and elaborate certain fundamental claims about determinants of curiosity and about relationships between curiosity, questioning and learning. We made these checks in secondary schools with mainly working class council estate catchment areas. In chapter 3, the analysis linking perceived value, relevance and surprisingness, via interest, to the amount of questioning suggests that pupils' reports about topics are reliable and valid indicators of their feelings and are also useful predictors of their subsequent learning about the topics. The Newsom report plays the recurrent theme of the importance of 'relevance' and 'value'; Duffy's work provides empirical support for the underlying premisses. What is done to ensure that secondary school pupils do see that what they are doing is relevant and valuable? If what they are not-managing-to-learn has no likely relevance or value, it should be scrapped. If it has, then this relevance and value needs to be communicated to and accepted by the pupils? Time-consuming this may be, but perhaps more attention to pupils' views and a dialogue of persuasion might have cut the heavy early leaving rate of the lower working class. With the raising of the school leaving age, the problem is exacerbated rather than reduced for both teachers and pupils. Our implicit suggestion that if you want to know whether topics are interesting to pupils you should ask them may not be profound, but it is unheeded. It is common to hear around universities that students ought to be interested and that it is not part of the teacher's job to inspire some enthusiasm. Even if students should be enthusiastic, the observation that they are not means that it is futile (and irresponsible) to carry on regardless until they can be persuaded that what is being taught is relevant, valuable or interesting. And why should students or children be interested? It seems to be no more their duty to become enthusiastic than it is the responsibility of teachers to encourage the enthusiasm. Perhaps we should ask ourselves whether we fail to sell our subjects, because we do not see the relevance and value of what we are teaching and cannot justify what we are doing? Are we bored, anxious and frightened as well as our pupils?

Favourably impressed by the ease with which results of Berlyne and his colleagues could be duplicated and extended, we look in chapter 4 at a number of problems outside the constraints of traditional classroom experimentation. In the first section we look at both sociological and social psychological associates of the incidence and complexity of younger children's questions. The date enable us to construct a picture consistent with the ideas mentioned in the latter half of chapter 3 and at the same time permit a more precise specification of the answering behaviours of others likely to be conducive to the development of questioning skills and the accumulation of knowledge. That it is the behaviour of mothers and not teachers that is reported, does not, as far as we can see, preclude generalisation to the classroom.

Two field studies add little to our understanding of the relationship between pupil's evaluations and experience on the one hand and curiosity and questioning on the other, but are interesting in their own right as examples of ways of evaluating extra-curricular activities. The brief reports of conversations with working class teenagers are included to provide a thumbnail sketch of their views and states of mind. The final section offers some evidence about the changes in types and focus of questions with age and ability, with a postscript showing that if a tradition is established of asking questions about sexual behaviour, then there is no evidence to support fears that teenagers will treat such a situation as anything more than an opportunity to find out some facts of which they are ignorant.

Chapter 5 stands the problem of curiosity on its head. Chapter 2 showed that the links between curiosity and questions cannot be so tight as to make it sensible to see either as implying the other. Boredom is in a happier state. We felt safe in suggesting that the existence of boredom does entail the absence of both curiosity and questioning. If we wish to locate the uncurious, we can do so in terms of boredom. We exploited the generous provision of the data from the Young School Leavers report of Morton-Williams and Finch both to locate the bored and to examine the antecedents and consequences of boredom. The offspring of unskilled and semi-skilled workers are shown to be heavily over represented among those bored by more than thirty per cent of the subjects they were studying at school. Additional analyses enable us to construct a picture of a self-perpetuating cycle of boredom and low academic performance.

While chapter 5 yields a clear picture of social class differences in reported boredom, chapter 6 does not yield a similar result for questions. Reasons for this are discussed.

In chapter 7, the findings of social class differences in the efficiency with which individual questions are posed obtained with seven to ten year old children are not repeated with thirteen year olds. Neither does the use of sequences of questions in a diagnostic task provide better than weak support for the thesis that there are social class differences in these skills. Although the investigations were bedevilled by more than a sprinkling of cheating, this was not the main problem. We might have concluded that there are no important differences in the questions latent in the heads of middle and working class adolescents. We preferred to conclude that our failure to find differences was related to the earlier sorting-out processes of the educational system along social class lines, defects in our techniques, and the general willingness of pupils to do what is asked of them. We are not happy with this defensive retreat. It smacks of that very stubbornesss to face facts condemned in the quotations of Eysenck. In chapter 10 we discuss these issues more fully.

These failures to find important social class differences in the work reported in chapters 6 and 7 could have been pursued, but this pursuit would have required the mounting of large-scale surveys to be performed outside schools in our immediate area and the development of techniques for obtaining estimates of genuine questions. The first was beyond our administrative capacities, the second beyond the limits of our intellects; we just could not think of satisfactory viable techniques – and neither could those we consulted.

We chose rather to explore the relationships between curiosity, questioning and learning within the working class – as we have already indicated in our brief descriptions of the contents of chapters 3 and 4. In the last section of chapter 7 we look at the use of questions in problem-solving and suggest that a little training would greatly facilitate both the exploitation of questions for the analysis of problems and for problem-solving skills in general. The initial performance of adolescents in the use of diagnostic interrogation strategies seemed unnecessarily inadequate.

In chapter 8 Creed looks at factors associated with the selection of persons to whom questions can be posed. Who would know the answers to questions and who might be asked? The analysis shows that some teachers are more likely to be approached than others and that it is possible to point to attributes relevant to this approach.

Finally, in chapter 9, we pose two basic problems. Does the posing of questions in fact facilitate learning? Will the teacher's questions encourage learning as much as the pupil's own questions? As Prosser pursues his Poirot-like course, we come to see that universal generalisations about the relationships between questions and learning are unlikely to be valid. Children's own questions are not necessarily more or less effective than the teachers questions, the posing of explicit questions does not necessarily have advantages over either other linguistic transformations of materials or reading. However, generalisations are possible once relationships between the attitudes and capacities of the learners and the content and complexity of the materials are specified.

Chapter 10 provides an overview and discussion.

CHAPTER 1 INTEREST AND CURIOSITY IN THE EDUCATIONAL PROCESS

(L. ABRAMSKY)

1.1 INTRODUCTION

1.2 PRIMARY EDUCATION

1.3 SECONDARY EDUCATION

1.4 PRIMARY AND SECONDARY EDUCATION COMPARED

1.5 CONCLUSIONS

1.6 REFERENCES

CHAPTER 1

INTEREST AND CURIOSITY IN THE EDUCATIONAL PROCESS THE OFFICIAL VIEW (L. ABRAMSKY)

1.1 Introduction

The government periodically asks for reports on the state of the educational system and for recommendations as to how it might be improved. Committees are set up, and after spending time, effort, and money, they produce the required evaluation. It is desirable to to know how things are and what they might be. However, it is also worth examining the studies themselves. Do their concerns change through time? Do reports on primary and secondary education differ in instructive ways? Are the recommendations acted upon and the guidelines followed? And if not, why not? Our aims are more limited. We have examined what five different committees and one survey have had to say about children's interest and curiosity in relation to their formal education, both Primary and Secondary. By comparing the reports over time, it may be possible to ascertain the extent to which the recommendations of past reports have been acted upon.

The reports all make frequent mention of 'interest' and 'curiosity', although the words are not specially defined, being used in their everyday sense and assumed to be understood. The reports deal primarily with the power which interest and curiosity have to motivate people to learn. The reports see satisfaction of interest and curiosity as the chief intrinsic reward which the 'learner' can achieve. They see the most effective learning as being that which is motivated by intrinsic rather than extrinsic rewards. The reports also deal with interest and curiosity as goals of education. They speak of the arousal of new interests and the stimulation of existing ones as being very important functions of education. It is important to emphasise that only these specific aspects of the reports will be discussed in the following pages. There are many other aspects of education which are closely linked with the use of children's interest and curiosity in their formal education, such as training of teachers, pupil-staff ratio, type of schools, *etc.* These are all considered in the reports themselves but will not be discussed here.

1.2 Primary Education

We will consider two major reports on Primary School Education. Their terms of reference are similar, but not identical. The studies were separated in time by a period of thirty five years. The report of the Consultative Committee on the Primary School was submitted in 1931. The Committee was under the Chairmanship of Sir Henry Hadow. Its terms of reference were 'To inquire and report as to the courses of study suitable for children (other than children in Infants' Departments) up to the age of eleven in Elementary Schools, with special reference to the needs of children in rural areas. The Report 'Children and Their Primary Schools – A Report of the Central Advisory Council for Education (England)' was submitted in 1966. The Committee was under the Chairmanship of Lady Plowden. Its terms of reference were 'To consider primary education in all its aspects and the transition to secondary school'.

The terms of reference of the two reports are not so very different, although those of the earlier report specifically exclude infant school children. However, the social and educational milieus in which the two reports were submitted were different. Educationally, the aims of the primary schools before the 1931 report had to be different from those of the primary schools of the 1960's. It must be remembered that when the Hadow report was written, most children did not receive a secondary education. It has to be assumed that what they were not exposed to in primary school, they might never be exposed to. The report was written in the hopes and expectation that this situation would soon be remedied, and it was.

It is encouraging to compare the two reports because of the evident progress which was made in the primary schools during the thirty five year interval which separated them. Both reports stress the importance of using children's interest and curiosity in education. What the two committees had to say on the subject is not that different. However, one gets the impression that when Hadow made the recommendations about child-centred learning, such recommendations were relatively revolutionary in nature, whereas the Plowden Committee found that many of Hadow's recommendations were now accepted practices. The Plowden Report seems to be recommending changes which go further but in the same direction. They say, in fact, 'We conclude that the Hadow emphasis on the individual was right though we would wish to take it further. Whatever form of organisation is adopted, teachers will have to adapt their methods to individuals within a class or school' (Plowden 460). They add that, 'The gloomy forebodings of the decline of knowledge which would follow progressive methods have been discredited. Our review is a report of progress and a spur to more' (Plowden 461).

What then did the Hadow Committee find in 1931? They found that 'Hitherto the general tendency has been to take for granted the existence of certain traditional 'subjects' and present these to the pupils as lessons to be mastered' (Hadow xxiii) and observed that '. . . teaching by subjects . . . does not always correspond with the child's unsystematised but eager interest in the people and things of a world still new to him' (Hadow 101). They suggested that '. . . primary education would gain greatly in realism and power of inspiration if an attempt were more generally made to think of the curriculum less in terms of departments of knowledge to be taught, and more in terms of activities to be fostered and interests to be broadened' (Hadow xxii-xxiii) and that '. . . what is needed, therefore, is a new orientation of school instruction which shall bring it into closer correlation with the natural movement of children's minds' (Hadow 101).

Generally, one gets the impression that the Hadow Committee found schools which were rigidly set in their ways, schools which aimed to teach children certain subjects, schools whose prime concern was that their pupils all mastered certain skills and learned certain facts. In such schools learning was viewed as a more passive occupation than it is in most primary schools today. The Hadow Committee set out to change that, and judging by the findings of the Plowden Report, their hopes were realised.

The Plowden Committee found that 'Despite overcrowding and large classes, many post-war primary schools did much to enlarge children's experience and involve them more actively in the learning process — the main themes of the 1931 report' (Plowden 190). In fact, 'For a brief time 'activity' and child-centred education became dangerously fashionable and misunderstandings on the part of the camp followers endangered the progress made by the pioneers' (Plowden 190). However, 'The misunderstandings were never as widespread in the schools as might have been supposed by reading the press, and certainly did not outweigh the gains which were specially notable in the English subjects' (Plowden 190-191). Although the Plowden Committee found that progress had been made in the direction recommended by the Hadow Committee, they did not feel that the progress had gone far enough. They said that 'Instruction in many primary schools continues to bewilder children because it outruns their experience' (Plowden 195).

Both reports stress the important role of children's interest and curiosity in effective education. In the Hadow Report one finds such statements as:

> 'A child never works so well as when he is interested. It is accordingly most important that the teacher should take into account the children's own natural interests (Hadow 47-48).
>
> '. . . it must remain important to emphasise the principle that no good can come from teaching children things that have no immediate value for them however highly their potential or prospective value may be estimated' (Hadow 92).
>
> 'Other witnesses were equally emphatic as to the 'curiosity' of children of this age (7-11) describing it as a 'ruling principle' ' (Hadow 51).

In the Plowden Report one finds such statements as:

> 'The intense interest shown by young children in the world about them, their powers of concentration on whatever is occupying their attention, or serving their immediate purposes are apparent to both teachers and parents. Skills of reading and writing or the techniques used in art and craft can best be taught when the need for them is evident to the children' (Plowden 195).
>
> 'Children's interest varies in length according to personality, age and circumstances, and it is folly either to interrupt it when it is intense or to flog it when it has decline' (Plowden 197).

Both reports express views as to what the role of a good primary school should be. The Hadow Committee said 'A good school, in short, is not a place of compulsory instruction, but a community of old and young, engaged in learning by co-operative experiment' (Hadow xvii). The Plowden Committee said, 'In any case, one of the main educational tasks of the primary school is to build on and strengthen children's intrinsic interest in learning and lead them to learn for themselves rather than from fear of disapproval or desire for praise' (Plowden 196). Thus, they both said that a good school is marked by children playing an active role in their education. As the Plowden Report said 'finding-out' has proved to be better for children than 'being told' ' (Plowden 460).

The views of the two committees on the aims of primary education were rather different. This difference reflects the differences in British society, technology and the world at large in 1966 as compared with 1931. The Hadow Report says 'It (primary education) should arouse in the pupil a keen interest in the things of the mind and in general culture, fix certain habits, and develop a reasonable social or team spirit' (Hadow 71). The Plowden Committee felt that they could not state specific aims of primary education. However, they thought that it must be of such a nature as to enable children to cope with the world when they were adults, and the Committee felt that the only truly predictable thing about the world was that it would continue to be in a state of rapid change. Therefore, they '. . . will need above all to be adaptable and capable of adjusting to their changing environment . . . . They will need throughout their adult life to be capable of being taught, and of learning, the new skills called for by the changing economic scene' (Plowden 185). Thus, they wanted schools to help children to learn how to learn, and to learn to cope with change. This is a markedly less static view than that expressed in the Hadow Report. But we may also note that the reasons look to be concerned with the economic 'needs' of society rather than to educate the child as a human being.

In spite of the differences in the aims advocated by the two Committees, the advice as to what the schools should do in a general sense to achieve the aims is remarkably

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similar. The Hadow Report says again and again that '. . . the curriculum is to be thought of in terms of activity and experience rather than of knowledge to be acquired and facts to be stored' (Hadow 93), and that, 'The fundamental idea of starting from a centre of interest and exploring in turn the different avenues which diverge from it is involved, after all, in all intellectual activity which is not merely formal or imitative' (Hadow xxiii) and that 'While the indispensable foundations are thoroughly mastered, the work of the school should be related to the experience and interest of the children' (Hadow xxiv). The Plowden Report says that '. . . facts are best retained when they are used and understood, when right attitudes to learning are created, when children learn to learn' (Plowden 195) and that, 'Another effective way of integrating the curriculum is to relate it through the use of the environment to the boundless curiosity which children have about the world about them', (Plowden 198) and, 'If for example, children are allowed choice in what they do the choice must be genuine and the alternatives interesting and worth doing. Boredom is a deadly enemy' (Plowden 268). They warn of dangers and pitfalls: 'Any practice which predetermines the pattern and imposes it upon all is to be condemned', (Plowden 198) and, 'Children can also learn to be passive from a teacher who allows them little scope in managing their own affairs and in learning. A teacher who relies only on instruction, who forestalls children's questions or who answers them too quickly, instead of asking the further questions which will set children on the way to their own solution, will disincline children to learn' (Plowden 195).

The two reports differ slightly in the specific tactics they recommend. This seems to be the result of natural progress due to trial and error. The Hadow Committee recommended certain tactics; they were tried out to some extent although they were probably misinterpreted frequently. The Plowden Committee was able to see how these recommendations had worked in practice and how alternative schemes had worked, so it would indeed be surprising if they had not made some different tactical recommendations. The Hadow Committee recommended the use to a large extent (but not exclusively and less as the children got older) of the 'project method' of teaching. This '. . . takes the form of raising a succession of problems interesting to the pupils and leading them to reach, in the solution of these problems, the knowledge of principles which the teacher wishes them to learn' (Hadow 102). In its broader use 'Some centre of interest is selected and for a while the children's studies along many lines converge upon it or radiate out from it' (Hadow 103). The Committee said that 'Judiciously applied, and based upon more direct and intrinsic kinds of teachings it may be expected to impart a meaning and a motive to school work, and to afford the teacher a means of following the natural development of his pupils' interests' (Hadow 105). The project method did seem to have potential as a teaching method, but unfortunately it has not always lived up to this in practice.

The Plowden Report said of it that 'At its best the project method leads to the use of books of reference, to individual work and to active participation in learning. Unfortunately, it is no guarantee of this and the appearance of text books of projects, which achieved at one time considerable popularity, is proof of how completely a good idea can be misunderstood' (Plowden 199). It advocated a variation of the project method known as 'the centre of interest' method. In this method there are many centres of interest around which individuals, groups, or the class work. This does not seem to differ greatly from the 'centre of interest' method discussed in the Hadow Report. However, the Plowden Committee seemed slightly more willing than the Hadow Committee for the children rather than the teacher to choose the centres of interest and the methods of pursuing the interests. The Plowden Committee advocated use of the environment as a way of integrating the curriculum.

They spoke of the 'Discovery method' about which they said 'The sense of personal discovery influences the intensity of a child's experience, the vividness of his memory and the probability of effective transfer of learning. At the same time it is true that trivial ideas and inefficient methods may be 'discovered'. Furthermore, time does not allow children to find their way by discovery to all that they have to learn. In this matter, as in all education, the teacher is responsible for encouraging children in enquiries which lead to discovery and for asking leading questions' (Plowden 201).

The similarity overall in the attitudes of the two committees is perhaps best summed up by a comparison of the two following statement:

> 'It is generally recognised today that children can play a far more active part in their education than is possible under a predominance of class teaching and that they differ greatly in their powers and rate of learning. It is widely held that children should be allowed as far as possible to proceed at their own pace' (Hadow 152).
>
> 'We recommend a combination of individual, group and class work and welcome the trend towards individual learning' (Plowden 294)

The chief difference is that the Hadow Committee was saying that they agreed with widely held opinions and thought these opinions should be put into practice, whereas the Plowden Committee was saying that they agreed with the current trend in practice and thought it should be judiciously extended. This surely would seem to indicate that progress has been made.

1.3 Secondary Education

We will now consider three reports on Secondary Education which were written over a thirty seven year span. The three reports have different terms of reference, but all are concerned with the education of at least some children between the age of eleven and the time they leave school. The Report of the Consultative Committee on The Education of the Adolescent was submitted in 1926. The Committee was under the chairmanship of Sir Henry Hadow. It considered the post-primary education of those children who did not go to the what were then Secondary schools. At that time such children were educated almost exclusively in elementary schools until the time that they left school at the age of fourteen. The Report of The Consultative Committee on Secondary Education with Special Reference to Grammar Schools and Technical High Schools was submitted in 1938. The Committee was under the chairmanship of Mr. Will Spens. The terms of reference are apparent from the title, although it considered in passing some aspects of Secondary Modern Schools. The Report 'Half Our Future', A Report of the Central Advisory Council for Education (England) was submitted in 1963. The Committee was under the chairmanship of J.H. Newsom. It considered the education of pupils between the ages of thirteen and sixteen who were of average or less than average academic ability. This meant that the report dealt only with Secondary Modern and Comprehensive Schools. Keeping in mind these great differences in time, milieu and terms of reference, let us examine and compare what the three reports had to say about curiosity and interest and the use which can be made of them to increase the effectiveness of Secondary Education.

At the outset we can say that all the reports stressed the need to engage the pupils' interest if the pupils were to make the best use of their educational opportunities. We find unequivocal statements to this effect in all the reports:

> 'Moreover, with transition from childhood to adolescence, a boy or girl is

> often conscious of new powers and interests. If education is to act as a stimulus — if it is to be felt to be not merely the continuence of a routine, but a thing significant and inspiring — it must appeal to those interests and cultivate those powers' (Hadow 75).
>
> 'Sound teaching, it is recognised, must be based upon the pupil's interests; . . .' (Hadow 107).
>
> 'It is recognised today that he learns best who learns with interest and with purpose, or to put it in another way, he learns best who sees meaning and significance in what he learns'. (Spens 78).
>
> 'We have learnt that just as men work best when their hearts are in their jobs so boys and girls work best when they are interested in their work and see its purpose' (Spens 143).
>
> 'We suggest that for a syllabus to be effective it must succeed at every stage in stimulating the interest and imagination of the pupils' (Spens 245).
>
> 'We consider that the group of impulses broadly described as curiosity which emerge at this period may offer a powerful handle for intellectual instruction' (Spens 361 — Recommendation 51).
>
> 'Only he (the teacher) can find out what interests his pupils, and he must begin, though not end, with that' (Newsom 153).
>
> 'At the bottom end of the scale it is a matter of finding a very few things in which the pupils show interest and can make progress and working outwards from them' (Newsom 124).
>
> 'Pupils ask "What's it all for? What's it got to do with me"? Unless they are satisfied with the answer, their interest sags' (Newsom 111).

It will be noticed that in the two earlier reports it was felt necessary to make explicit the premise that pupils learn more efficiently if they are interested in what they are learning. This idea is now so widely accepted as to be commonplace. The Newsom report seems to be dealing more with tactics than with policy. It seems to accept as given that it is vital to first get the pupils' interest. It then poses a problem 'How can we engage the pupils' interest?' and offers some suggestions as to the solution of the problem. The suggestions centre around the concepts of relevance and participation. It expresses this when it says 'We believe that these four words — practical, realistic, vocational, choice — provide keys which can be used to let even the least able boys and girls enter into an educational experience which is genuinely secondary' (Newsom 114). The Committee operationally defined these words. By 'practical' they meant subjects in which the pupils were doing something rather than sitting at a desk. They included such subjects as art, music, physical education, wood and metal work, rural studies, housecraft, and needlework. These can easily be seen to answer the requirement for participation, and they felt that for less able pupils such subjects were also more relevant to their life outside of school. By 'realistic' they meant teaching the more academic subjects in such a way that they have meaning for less able adolescent pupils. This might mean relating mathematics to household budgeting or calculating taxes. It might mean using specific community problems as a spring-board for the study of 'civics'. This answers the call for relevance and encourages active participation on the part of the pupils. 'Vocational' was included because most of the children that they studied would be leaving school as soon as they could, and it was felt that well before that time they began thinking ahead to the time when they would be working and earning money. Many of the girls were already thinking ahead to the time when they would be married and keeping a house. Education which is seen by the pupils to be of some use in the future will seem relevant to them. 'Choice' can be allowed to the pupils as to which subjects they do and do not do. Also, once they have chosen a particular subject they can have some say in how they approach it. This was seen to be important both because it encourages a pupil to learn how to make decisions and because it allows the pupil to participate in the decision of how he will spend his time and thus to assure (hopefully) that it will be in a way which is relevant to him.

This is all fairly specific advice on ways of engaging the pupils' interest. It is not so very different from views expressed in the 1926 Hadow report on children who would probably be leaving school at an early age. We find in the Hadow report such statements as:

> '. . . the curriculum for older children has too frequently been divorced from real life, and that many pupils, in consequence, lose interest and merely mark time in their last years at school . . .' (Hadow 101).
>
> 'It was generally observed that children during their last years at school took the greatest interest in those subjects which were most likely to be of practical use to them on leaving school' (Hadow 117).
>
> 'Accordingly 'practical work' in its several forms must fill a large place in the curriculum. But this does not mean that the pupils' intellectual training is to be regarded as of secondary importance. It has been amply shown that for many children the attainment of skill in some form of practical work in science, handwork or the domestic arts may be a stimulus to higher intellectual effort. In other words, the child's predilections being towards things practical, his intellectual activities are most strongly stimulated when they are directed to practical ends. Moreover, apart from the question of stimulus, boys and girls with the type of interests we have in view can grasp concepts through practical work much more easily than by devoting long periods to the abstract study of ideas. The abundant practical work which we wish to see provided in the new schools is thus to be regarded partly as a means of intellectual training especially suitable to the interests and capacities of the majority of the pupils' (Hadow 108).
>
> 'The courses of instruction in the last two years of the post-primary schools retaining a considerable proportion of pupils up to the age of 15+, should not be vocational. At the same time, however, the treatment of subjects such as history, geography, elementary mathematics, and a modern language, should be 'practical' in the broadest sense, and directly and obviously brought into relation with the facts of every day experience.' . . . . 'Thus, the courses of instruction, though not merely vocational or utilitarian would aim at linking up the school work with interests arising from the social and industrial environment of the pupils' (Hadow 88).

Thus it can be seen that the Hadow report also stressed the importance of relevance and participation. It used the words 'practical', 'realistic' and 'vocational', but was perhaps less explicitly concerned than the Newsom report was with the pupil's choice of subjects. It would seem that not enough progress has been made in these areas since 1926 if such similar recommendations are still needed. The 1938 Spens Report, on the other hand, made some very different sorts of suggestions about engaging the pupils' interest. However, it must be remembered that it dealt with only those pupils attending grammar schools and technical high schools, and thus it is not surprising that it stressed the need to engage the pupils' interest in intellectual problems in a strictly intellectual way. In it we find such statements as:

> 'It's study (the Bible) provides a valuable intellectual discipline and quickens the interest of many young minds' (Spens 209).

> '. . . there are few pupils of normal intelligence whose imagination is not stirred, whose interest is not awakened, whose powers are not engaged when they are brought, under wisely chosen conditions and by competent teaching, into contact with any of the great cultural traditions' (Spens 157-158).

However, the Spens Report did say that pupils' interest would be greater for more relevant aspects of subjects. For example, it suggested that 'Recent (as opposed to distant past) political and economic history affords in consequence the best introduction to an interest in politics' (Spens xxiv), and it suggested vocational courses when it spoke of '. . . the gain from work which the pupil himself recognises as possessing value for the next stage of his life, since such work serves to hold and to stimulate his interest, and is likely to react favourably on all his work' (Spens xxv).

Both the 1926 and the 1931 studies expressed the worry that the schools they studied did not always take sufficient care to arouse the pupils' interest through ensuring that the curriculum was relevant. Thus, we find such statements as:

> 'It appears from the replies that, where it was true, that the older pupils in Elementary Schools had lost interest in their work during the last years at school, this result had often been due not only to inadequate staffing and the absence of proper equipment, but also to the fact that the instruction given appeared to the pupils to have little or no bearing on the problem of their daily environment' (Hadow 118).

> 'The charge that the secondary school curriculum is out of touch with the interests of practical life is a charge — we fear not ill-founded. . . .' (Spens 163).

The Spens Committee also expressed worries that the way in which subjects were taught might tend to suppress interest rather than awaken it. They felt, for example, that the study of set books in Literature, or the over-emphasis on formal grammar in composition could inhibit the pupils' appreciation for literature and their ability for self-expression.

The Newsom Report expressed the worry that 'their children' were too frequently characterised by boredom in and out of school and work. However, it did not blame anyone or anything specifically for this but rather presented it as a challenge to the schools, *i.e.* the task of stimulating children who are relatively difficult to stimulate.

All the reports express the opinion that one of the important functions of secondary education is to awaken interests in the children which will enrich their future life. A few examples of such statements are:

> 'Finally, we would urge the desirability of generating from the school studies interests which will continue through after-life and will enlarge the opportunities for a fuller enjoyment of leisure' (Hadow 110).

> 'It (a course of instruction for pupils between the ages of 11 and 16) should stimulate or create the desire to continue some form of study whether or not pupils leave school at 16' (Spens 169).

> 'They should know where to turn, when they are ready to take up a new interest or want to continue an old one started at school' (Newsom 77).

> 'There are many positive reasons why "extra-curricular" provision is important. For the individual boy and girl, it can mean the discovery of new interests' (Newsom 43).

One is left then with the general impression that in the area of interest and curiosity and their relation to education the similarities between the reports outweigh the differences.

This is especially true if one considers only the 1926 and 1963 reports which are about more similar sorts of pupils although the 1926 report includes a wider range in terms of both age and academic ability than does the 1963 report. The question is, of course, why do these things still need to be said?

It was partly to find out why these things still need to be said and how existing secondary education and the proposed extra year of compulsory secondary education can be made meaningful to more pupils that the School's Council requested a study to be done of Secondary Education. In 1968, the Government Social Survey submitted a report prepared for the Schools Council entitled 'Young School Leavers'. This report was prepared when it was thought that the school leaving age would be raised in 1970, and the problems and opportunities caused by this proposed raising of the minimum school leaving age were considered in the report in addition to many other problems which were also considered in the Newsom report. The important difference between the two reports is that the Schools Council Enquiry obtained its information by going directly to pupils, ex-pupils, parents of pupils, and teachers. The pupils were from the thirteen to sixteen year group as in the Newsom report, but they came from a cross-section of all maintained schools. The ex-pupils included those in the fifteen to sixteen year group who had just left school and also some from a sample nineteen and twenty year olds. In contrast, the Newsom Committee obtained its information about the schools, the pupils, and the problems from the Headmasters of a representative sample of Secondary Modern and Comprehensive Schools. The two reports are interesting to compare since they were prepared within a few years of each other and are about many of the same sorts of pupils, but rely on different sources of information.

In the Schools Council Enquiry (S.C.E.), youngsters between the ages of thirteen and sixteen who intended to leave or had left school at fifteen were asked how important they thought various functions of school were. It was found that the vast majority of them felt that '. . . the main purpose of school in general was to provide the tools necessary for success in later life . . .' (S.C.E.32) and that 'This same broad picture was found whatever the expected leaving age of the young person' (S.C.E.32). 'Aims concerned with widening interests and broadening the mind were very generally rejected by all leaving age groups' (S.C.E.36). In fact it was noted that 'It appears that those who expect to stay at school until sixteen or older may have an even more narrowly functional idea of what the main aims of their education should be than do the fifteen year old leavers' (S.C.E.37). This careers function of school was seen to be just as important to the nineteen and twenty year age group, although they were not as concerned as the youngsters were with schools teaching skills directly applicable to particular jobs. However, those nineteen and twenty year olds who had not gone on to any further education were more likely than were the youngsters to feel that the school should teach things which would widen their interests. As for the parents of fifteen year old leavers, they '. . . almost universally saw as very important functions of the schools the teaching of things which would enable their child to obtain as good a job as possible and the imparting of the basic skills of being able to write correctly and to speak well and easily . . . in general the objectives concerned with widening interests and increasing awareness were much more widely valued by parents than youngsters' (S.C.E.38). The teachers, and especially the head teachers, placed much less stress on the importance of the careers aspect of schools than did the pupils, ex-pupils, and parents.

This great discrepancy between the views of the pupils and those of the teachers would seem to be important. Such a conflict of aims could play havoc with attempts to engage the pupils' interest. That aspect of education which the pupils see as relevant is not highly valued by the teachers. It is indeed curious that the Newsom Report managed to reflect quite accurately the pupils' views even though the Committee's source of information was the Head Teachers. This may indicate that although the Head Teachers disagree with the pupils as to the most important functions of schools, they do know what the pupils want from school. The teachers are of course faced with a dilemma; if they are to engage the pupils' interest, the education must seem relevant to the pupils. However, if the education is made increasingly relevant in the pupils' terms, the teachers may feel that it is of little value. Clearly, the teachers must also see the relevance of what goes on in school if they are to be good teachers. One hopeful sign is that the teachers in the Schools Council Enquiry seemed to agree with the recommendations of the Newsom Committee in their endorsement of the idea that with the raising of the school leaving age the curriculum should have a practical emphasis in terms of type of subject, active participation of pupils, and relevance to their out of school life.

Youngsters who were or would become sixteen year old leavers were asked to rate subjects in terms of their usefulness and how interesting they were. Nearly all of those asked felt that English and Mathematics were very useful. However, they were much less likely to rate these subjects as interesting. Therefore, in terms of the Newsom Report, it would seem that these subjects were seen to be relevant but that the way in which they were taught was not, perhaps because of the specific content or the manner of presentation. The Schools Council Enquiry concludes that 'If a subject is seen as useful it is to be expected that this would increase its chances of holding the interest also. Although this is true in general it is clear that there are subjects which appreciable numbers of pupils see as useful but not interesting and conversely as interesting but not useful' (S.C.E.58). In other words, relevance is necessary but not sufficient to engage interest.

The survey then went on to enquire what made a subject boring to pupils. All the youngsters who had named any subject as boring were asked what it was about the subject that made them boring. 'Getting on for half the fifteen year old leavers (girls more than boys) complained that they did not understand the subjects, they were not explained enough and they were not good at them' (S.C.E.65). 'Approaching half were bored by the monotony and repetitiveness of subjects. They felt that they were doing the same thing all the time, there was not enough variety or lessons were taken too slowly' (S.C.E.66). Some complained that they could not actively participate in the lessons, some that the subject was of no use to them, some that they did not like the teacher who taught the subject, and some that the subject was old-fashioned. Although many of these apparent shortcomings could be corrected by greater application of the four principles called for in the Newsom Report, 'practical', 'realistic', 'participation' and 'choice', it is clear that the important factor in keeping the interests of the pupils is the ability of the teacher to correctly assess their degree of understanding of the various aspects of a given subject and his further ability to gear his teaching to this assessment. This implies the usefulness of more individual work, as pupils will have different problems with the subject matter or skills they are learning.

Youngsters were asked whether they would like to be given the choice as to which subjects they did. Half the fifteen year old leavers said that they would have liked to choose their subjects or to take subjects outside those already on their curriculum. A higher percentage (64%) of sixteen year old leavers would have liked such a choice, and an even higher percentage (72%) of seventeen to eighteen year old leavers would have liked to choose. Within the fifteen year old leaver group the less able pupils were more likely than the more able pupils to think it was better for their teachers to decide which subjects they should do. It would certainly seem that the amount of confidence which pupils had in their decision making ability played a large part in determining whether or not they thought they should choose their own subjects. If this were not the case, it would be hard to explain the fact that although '. . . the fifteen year old leavers were more likely than older leavers to say that a higher proportion of their school subjects were useless and boring' (S.C.E.69), they were less likely than the older leavers to want to chose their own subjects. This would seem to underline the point made in the Newsom Report that it is important for the average and below average pupils to learn how to make decisions. It should be mentioned here that the pupils' boredom was not confined to school. A substantial number of them complained of being often bored in their spare time. This problem was mentioned by the Newsom Report.

Teachers worried about their pupils' boredom, and this played a large part in their thoughts about the proposed raising of the school leaving age. The report states that 'The majority of teachers, then, had reservations about the advantages of keeping at least some of their pupils on at school. The most frequently mentioned reasons for their doubts lay in the pupils' own attitude to school. These teachers did not feel confident in their ability to get through the pupils' apathy, boredom and lack of interest in anything to do with school' (S.C.E.89). However, some teachers were more optimistic and saw the raising of the school leaving age as an opportunity to develop their pupils' interests. The fact that the majority of teachers still feel that the pupils exude apathy and boredom would seem to indicate that progress in engaging the pupils' interest in secondary education is not going forward at an overwhelming pace. However, one optimistic sign is that many of the parents thought that the subjects taught at the time of the enquiry were more interesting or up-to-date than those taught when they themselves were in school. If they were correct in their assessment, this does indicate progress. Perhaps the baseline from which progress is being made was so low that it will take a great deal of progress before startling results can be seen in terms of pupils' interest.

Both reports stress the need to engage the pupils' interest, and in many ways they agree on how this might be done. The area in which they do not agree so closely is in the analysis of how much progress has already been made. The Newsom Report is perhaps more cheerful in its assessment of the current situation than is the Schools Council Enquiry. However, this difference may be due largely to the fact that the Newsom Committee set out to make recommendations on how things should be, while the Schools Council Enquiry by virtue of the way in which it was carried out necessarily found out more about how things are now in the eyes of the various participants in the process of Secondary Education.

1.4 Primary and Secondary Education

We have now considered two reports on Primary Education and four reports on Secondary Education. All six reports have much to say about the use of children's interest and curiosity. It is interesting to compare the findings and recommendations of the Primary Education with those of the Secondary Education reports.

All the reports expressed the opinion that if education was to be effective the pupils' interest must be engaged. This has already been amply documented in the earlier pages of this paper. There is, however, a difference across age as to how difficult the task of engaging the pupils' interest is seen to be.

The single most alarming difference which strikes one immediately is that while the reports on Primary School speak of the great natural curiosity which children have when they first begin school, the reports on Secondary education stress the boredom with school and with life in general – which characterises children in the later years at school. One feels that something is very wrong if, after eight years of school, children have not only failed to further develop their curiosity, but have lost what they had. If one of the functions of the school is seen as that of arousing pupils' interests – as it is seen to be in the reports studied – then the schools are surely failing if many pupils move from a state of great curiosity at the start of their school career to one of great boredom at the finish of it. Based solely on the evidence of the reports, one gets the impression that the metamorphosis from the interested pupil to the bored may take place in the first two years of Secondary school. If this is so, then why is it? Could it be the rigid compartmentalising of all knowledge into subjects which have little meaning to the pupils? This is certainly one possibility put forward by the various committees which studied Secondary Education. Could it be that for some pupils all work is geared towards success at exams while the alternative is no threat of exams and a sure sense of failure? These and many more possibilities present themselves.

However, there are three alternative possibilities which need careful consideration. Perhaps the Plowden Committee was a bit over-optimistic in its report. Perhaps most children are already bored by the time they leave primary school. Maybe the stimulating education which the Plowden Committee reported on is not nearly so widespread as they believed it to be. Another possibility is that most children are not bored when they enter secondary school and are in fact still interested when they get to the last two years in school, but that the education they are offered at that point is so irrelevant to them that they appear to have been bored from the start. Lastly, it would be unfair to the schools to place all responsibility on them without even considering the possibility that there could be a natural decline in curiosity as children get older – perhaps based on their stage of psychosexual development, growing family and social pressures, or just the fact that as they live longer less is new to them and they take more for granted. This last alternative is a possibility, but even so it should only present a challenge – not an insurmountable obstacle.

The Primary School Reports and Secondary School Reports both stress the need for education to be seen by the pupil to be meaningful and relevant to his life. In both cases there is a suggestion that use should be made of the environment of the child. For the primary school pupil, this is largely because he will have the greatest of difficulty in understanding concepts which cannot be related to his environment. For the secondary school pupil it is because he is less likely to see the point in learning about something the further removed it is from his environment. In the reports on Primary Education there is more stress on how children can best learn as well as what they will learn with interest. The reports on Secondary Education are more concerned with what the children learn. Perhaps this emphasis should be shifted a bit in view of the findings we see in the report 'Young School Leavers' in which the complaints made most frequently by the pupils are related to how the subjects are taught rather than which subjects are.

It seems ironic that at precisely the stage in education (*i.e.* at the secondary level) when most pupils are more able to find out things for themselves, because they have mastered the techniques of reading and simple arithmetic and because their powers of reasoning are more developed, the emphasis on the 'discovery method' tends to be dropped. However, it is certainly true that less emphasis is put on it in the reports on Secondary

Education than in those on Primary Education. The reports on Secondary Education do stress the importance of the pupil participating actively in the learning process – but this seems to be more in terms of making things in the 'practical subjects'. One is left with the impression that learning gets more passive in nature as the pupils get older and that as it gets more passive the pupils disengage themselves from the educational process. One is then left with teachers who are teaching but pupils who are not learning, or perhaps, more correctly, teachers who are trying to teach, but are not succeeding.

It is not then surprising that teachers are worried about how they will handle pupils during the extra year at school. Many pupils get little or not extrinsic reward for applying themselves at school – so they will only be motivated to try if they get intrinsic rewards.

1.5 Conclusion

The general impression one gets is that the recommendations in the field of interest and curiosity have not changed much over the years, except to go slightly further in the same direction. However, the descriptions of how things actually were at the times of the various studies did tend to change over time to some extent; this is especially true as regards the primary school reports.

This could lead to the feeling that all is well; however, as has been pointed out, a large number of pupils are said to be bored with school and anxious to leave at an early age, well before even the present school leaving age. We have already considered some of the possible reasons for this. Whatever the reasons, there is clearly a need for effective concern.

1.7 References

Central Advisory Council for Education (England) (B. Plowden)
Children and their primary schools. London : Her Majesty's Stationery Office, 1967.

Central Advisory Council for Education (England) (J.H. Newsom)
Half our future. London : Her Majesty's Stationery Office, 1963.

Consultative Committee on the Education of the Adolescent (H. Hadow)
Education of the adolescent. London : Her Majesty's Stationery Office, 1926.

Consultative Committee on the Primary School (H. Hadow)
The primary school. London : Her Majesty's Stationery Office, 1931.

Consultative Committee on Secondary Education (W. Spens)
Secondary Education. London : Her Majesty's Stationery Office, 1938.

Morton-Williams, R. & Finch, S. *Young school leavers.*
London : Her Majesty's Stationery Office, 1968.

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CHAPTER 2 CURIOSITY AND INTEREST : FACTS AND THEORY (M.G. DUFFY)

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2.8 BIBLIOGRAPHY

An additional problem is posed by the results of an experiment by Eisenman (1968), who found that more complex geometrical shapes were rated significantly 'more novel' than simpler ones; this raises the possibility that in some cases at least, increased exploration or attention to stimuli defined as 'more complex' could be attributable to novelty effects.

The novelty of a stimulus or event can be defined at the simplest level in terms of the frequency with which it has occurred in an individual's experience. Hutt distinguishes three sources of novelty: 'object', 'environment' and 'person', with differing behaviour effects. It is the first of these with which we are mainly concerned here. Berlyne categorises novelty as 'complete', 'long-term' or 'short-term'. Most relevant empirical studies have attempted to manipulate the last of these by controlling the frequency of occurrence of stimuli within an experimental session. Using such a procedure, Berlyne and Parham (1968) had students rate a series of coloured shapes for novelty along a seven-point scale. Subjective novelty of stimuli declined over repeated exposures, and increased following repeated exposures of a different stimulus. Also, the more respects in which the new stimulus differed from the familiar one, the more novel it was judged.

The other collative variables that have received experimental attention are surprisingness and incongruity. These, as Hutt points out, can be regarded as instances of what Berlyne terms 'relative', as opposed to 'absolute', novelty. Surprisingness involves the violation of expectancies based upon past experience, while incongruity depends on a novel, and more or less improbable, juxtaposition of otherwise familiar stimulus elements or events.

2.1.3 Collative variables and exploratory responses

The majority of the studies reviewed here have used two-dimensional visual stimuli to represent varying levels of collative variability, while their power to elicit attention (specific exploration) has generally been operationalised as the length of time spent fixating them, or as the choice of one stimulus to fixate in preference to another. However, numerous variations of these dependent variables have been employed, as well as, in some cases, physiological indices of attention. Studies involving infants, children and adults as subjects are described in separate sections, and as far as is convenient, studies using complexity and novelty as their independent stimulus-variable are dealt with separately.

2.1.3.(i) *Infant studies.* Two main indices of curiosity have been used in infants: the time a child will continue to attend to a stimulus and the amount of slowing down in heart rate. Well over thirty studies have examined relationships between children's responses and degrees of complexity or novelty and habituation to both. These cannot be reviewed in detail here, and while there are differences in results obtained, especially with the heart rate maasure, there seems to be little doubt that 'intermediate' degrees of complexity and novelty are associated with longer fixation and that habituation to stimuli proceeds more rapidly in older children. Both 'complexity' and 'novelty' are relational rather than categorical terms in that they are a joint function of the objective complexity level of stimulation and the individual's already existing knowledge and information-processing capacity. Since this normally increases with age older children typically attend more to increasingly complex stimuli. This work is reviewed in detail by Kagan (1971). It is of insufficient immediate relevance to merit inclusion here.

2.1.3. (ii) *Adult studies.* The investigation of responses to collative stimulation in adults and children has on the whole been more directly stimulated by Berlyne's theorising than the infant research referred to above.

Berlyne and his associates have reported a series of studies using a standard set of visual materials comprising stimulus pairs representing 'more irregular' (MI) and 'less regular' (LI) values of complexity and incongruity variables. Berlyne (1966a) describes these as follows:

A. Irregularity of arrangement
B. Amount of material
C. Heterogeneity of elements
D. Irregularity of shape
E. Incongruity
F. Incongruous juxtaposition.

Pairs A to D consist of abstract patterns, E and F of meaningful pictures. In more recent studies, three further pairs of patterns have been added representing a higher absolute level of complexity, in order to determine whether increased attention to higher complexity reflects merely a tendency to avoid very simple stimulation. These pairs are described as:

XA. Number of independent units
XB. Assymmetry
XC. Random distribution

Day (1965) has found that the four levels of complexity defined by Berlyne on an a priori basis are rated as increasingly complex by adults.

In the first study using these materials (Berlyne, 1957) subjects were allowed to press a button to give themselves as many brief (0.14 second) tachistoscopic exposures of the figures as they wished before passing on to the next. MI members elicited significantly more responses than their LI counterparts in each category. When the pairs were shown side by side on a screen (Berlyne, 1958 a; b), the MI members attracted a significantly greater proportion of the viewing-time allotted, whether it was ten seconds or two minutes.

Studies using choice response-measures have produced less clear-cut results. Berlyne (1963b), projected the members of each pair in turn, and subjects were required to take a further look at one of them. There was a tendency of MI patterns to be selected when the initial exposure was brief (0.5 or one second), and LI patterns when it was longer (three or four seconds). Using a three-second initial exposure, Berlyne and Lewis (1963) found that on average, subjects chose to prolong MI stimuli just over half of the time. Also, once exposed, the MI members of the three high complexity categories tended to attract less looking than their LI counterparts. This result was replicated by Berlyne and Lawrence (1964) using a free looking-time measure, and Day (1966 a;b) using paired-companion and free looking-time procedures respectively, suggesting that even for adults, the relationship between complexity and perceptual curiosity arousal may be curvilinear rather than linear.

Other complexity effects. Brown (1967) found that three-dimensional patterns were viewed longer than two-dimensional, and patterns with different coloured components longer than patterns with components of the same colour. Leckart (1966) found a linear relationship between free looking-time and rated complexity (high, medium and low) of coloured slides of objects and landscapes. Evans (1970) found that the time spent inspecting a series of six prose paragraphs increased linearly with their 'complexity' measured in terms of difficulty of Cloze completion.

Other incongruity effects. Nunnally, Faw and Bashford (1969), and Faw (1970) found increased viewing over four levels of incongruous juxtaposition of animal- and object-features, using paired comparisons and free looking-time measures respectively.

Novelty effects. In the case of adults and older children, it is possible to estimate how often particular stimuli have been encountered, and thus to manipulate relative novelty and familiarity on an a priori basis. Such a procedure was used by Crandall (1967) who found that pairs of words defined as 'unfamiliar' in terms of Thorndike-Lorge frequency were more effective in holding subjects' attention than 'familiar' pairs, the latter resulting in more frequent alternations of fixation and more fixations away from the display.

Other experiments have used procedures similar to those of infant studies already described with similar results (e.g. Faw and Nunnally, 1971; Leckart, 1966).

2.1.3.(iii) *Child studies.* A number of studies have investigated complexity and incongruity effects, employing the button-pressing exposure task used by Berlyne. For example, Pielstick and Woodruff (1964; 1968) found pictures and diagrams rated as 'complex' elicited significantly more 2-second exposures than a corresponding set of 'simple' drawings in seven and eleven year olds. The later study also demonstrated significant effects for incongruous photographs over their banal counterparts.

Other studies of complexity effects. Cantor, Cantor and Dittrichs (1963) used a variant of the Berlyne (1958a;b) procedure with pre-school children. The subjects were shown six triads of figures for one minute each. Each triad comprised patterns of relatively high, medium and low complexity, and subjects were told to look as long or as little as they wished at each member in the time allotted. The high-complex patterns attracted significantly longer fixations than the other two categories.

Hoats, Miller and Spitz (1963) report a series of experiments carried out with a group of mental retardates with a mean chronological age (CA) of fifteen years and a mental age (MA) of eight, together with normal comparison groups of equal CA and MA. Thirty stimulus-pairs, mainly taken from Berlyne's, and representing six complexity and incongruity variables were presented for three seconds each, after which subjects were able to prolong the exposure of either member for up to thirty nine seconds. Overall, the mean number of MI (more irregular) choices was only 10.33 out of the thirty possible, although the equal CA subjects viewed their MI selections longer than their LI ones.

Hutt and McGrew (1969) similarly used both selection and fixation measures, with the difference that their subjects (five, eight and eleven year olds) were able to initiate for themselves exposures of simple or complex patterns by pressing one of two different coloured buttons. No significant differences appeared between the number of complex and simple stimuli exposed, even though the older subjects were aware that two buttons produced different kinds of patterns and exposed their complex choices longer than their simple choices.

Other studies of incongruity effects. Faw and Nunnally (1968) replicated the findings of their adult studies demonstrating a linear relationship between level of incongruous juxtaposition and fixation-time, under both paired-comparisons and unpaced looking conditions, with seven to ten year olds.

Novelty effects. A series of studies by Cantor and Cantor investigated habituation and recovery of attention in kindergarten children using black-and-white or coloured drawings as stimuli. They demonstrated fixation decrement over five successive exposures of stimulus sets and recovery to non-familiarised stimuli with greater recovery after eight habituation trials than after two (See Cantor, 1969).

Lewis, Goldberg and Rausch (1967) and Lewis and Goldberg (1969) found decrements in fixation, in three year olds over six thirty-second exposures of patterns and drawings, and recovery of these responses when variants of the stimuli appeared on a seventh trial.

A number of studies with young children have demonstrated a tendency to approach novel toys in preference to familiarised ones. Mendel (1965) gave groups of three to five year olds an opportunity to play with one of five sets of eight toys of which all, six, four, two or more had been exposed previously. The sets were thus considered to represent 0, 25, 50, 75 and 100 per cent relative novelty. Frequency of choice was found to be linearly related to novelty. Harris (1965; 1967) found a significant tendency to choose an unfamiliar toy rather than one that had previously been shown for four minutes, even if the novel toy was damaged.

Hutt (1966; 1970a) used a more complicated experimental set-up to investigate habituation effects. Children aged between three and five years old were placed individually in a playroom for six ten-minute periods. The room contained five familiarised toys and a novel object, namely, a rectangular box with a lever that could be moved in four directions; certain movements could cause lights to come on, bells to ring, or counters to work, while other movements had no particular contingencies. Investigation of the object was found to be more prolonged under more complex feedback conditions, while with minimal or no feedback it declined rapidly after the first trial.

Age, intelligence and specific exploration in children. Experiments which have compared fixation responses of children and adults to the same stimuli have produced inconsistent results. Burgess (1956), in his replication of the first Berlyne study, found that five year olds exposed the stimuli more than five times as long as a group of adults. This could be interpreted as signifying that the children, with their lower information processing capacity, required longer to reduce uncertainty to a threshold level. However, Faw, Nunnally and Ator (1969) found no differences between eight to twelve year olds and adults in fixations of dot-patterns varying in uncertainty, while Faw (1970) found adults looking significantly longer than ten year olds at incongruous drawings. It is possible that Burgess' results were due at least in part to the children deriving greater pleasure than the adults from operating the tachistoscope!

If children who are younger or less intelligent do require more time than those older or more intelligent to take in the same amount of information, as is suggested by infant habituation studies, then it may be predicted that they will show longer fixations to the same stimuli. However, Kagan and Livson hypothesise more advanced children should be differentially responsive to higher levels of collative variability, and given the impossibility of defining these levels, precise predictions seem to be ruled out. Contrary to the first hypothesis, Pielstick and Woodruff (1964) found that fixation times were positively related to both age and intelligence among seven and eleven year olds. In their later study (1968), these variables had no effect when a different set of complexity stimuli were used, but younger children did show more attention to pictures varying in incongruity. Ashton (1965) and Melchert (1969) found that brighter ten and eleven year olds looked longer at patterns and at photographs of museum objects respectively, while LaCrosse (1967), using the Berlyne figures, found no differences between high and low intelligence six and eleven year olds.

The evidence relating to the second hypothesis shows more consistency; there does appear to be a general tendency for more cognitively advanced children to be more differentially attentive to more complex, incongruous and unfamiliar stimuli. In the Hoats, Miller and Spitz (1968) study, only the equal CA group looked longer at their MI than at their LI choices; for both the retarded and the equal MA subjects, MI and LI stimuli were fixated equally. The same difference was found by Flick (1970) between groups of normal and retarded children aged between five and thirteen, while all but the oldest retardates showed shorter fixation than their normal age-peers. Hutt and McGrew found that exposure times of simple and complex patterns tended to decrease with age, but five year olds tended to fixate simple patterns longer than complex ones while the opposite was true for eleven year olds. For eight year olds, there was no difference. Black, Williams and Brown (1971) presented pairs of shapes containing between four and twenty sides to three and four year olds. A twelve sided shape was most often chosen for prolonged viewing by four year olds, while the younger group tended most to choose one with eight sides. This finding was replicated in a longitudinal study.

As regards novelty, Mendel reports that older children in a three to five year olds sample, chose less familiar toy-sets significantly more often than those younger, while Pielstick and Woodruff (1968) failed to find any age or ability effects on the time spent investigating various objects rated for novelty, either in overall or differential terms.

Collative variables and fixation-time. Berylne (1960, chap. 6), discussing his 1957 experiment, reports that subjects' comments showed that they tended to look at the stimuli as long as was needed for identification. Clearly, since complex patterns contain more detail than simpler ones, they require more prolonged attention before they can be registered, but it is doubtful whether the same interpretation can be made with respect to other collative variables. Although Berlyne seems to hold the view that all the collative variables affect specific exploration in the same way, he has, in different statements of his theoretical position, emphasised different internal constructs mediating between the two. Compare, for example, 'the condition of discomfort, due to inadequate information, that motivates specific exploration, is what we call 'curiosity' ', (1966, p. 25) with 'what underlies all the collative properties and gives them their common motivational effects is conflict, by which we mean a condition in which incompatible, mutually interfering patterns of behaviour are simultaneously mobilised' (1964, p. 23).

Allowing for the possibility suggested by Eisenman (1968) that 'complexity' effects may sometimes be mediated by novelty (in any case, all stimuli are more or less unfamiliar), it seems likely a priori that the 'inadequate information' interpretation may be more applicable to complexity, the 'conflict' interpretation to variables like novelty, incongruity and surprisingness, which involve a strong discrepancy between past and present experience. An experiment by Greenberger, Woldman and Yourshaw (1967) supports the notion that the function of visual fixation may vary according to the nature of the stimulus: groups of subjects given a prior 'curiosity set' or 'set to remember' both looked longer at collative stimuli significantly longer than a control group given 'neutral' instructions, but for the former, attention was prolonged predominantly to incongruous pictures, while for the latter the effect stemmed mainly from increased attention to highly complex patterns. Moreover, seventy per cent of the control subjects, when questioned after the experiment, reported having developed a self-induced curiosity or remembering set, and the same relationships obtained for them.

2.1.4 Complexity, novelty, exploration and liking

Although differential fixations can be described loosely as 'preferences', there seems to be no reason to infer that stimuli that attract longer fixations are 'liked' more than those which are fixated less. However, over twenty studies have shown that stimuli rated as more 'interesting' by subjects tend to be those that attract longer attention, *i.e.* 'interestingness' tends to increase with complexity, while judgements of highest preference or 'pleasingness' tend to be accorded to relatively simple or intermediately complex stimuli, though there is evidence for wide individual differences in the peak of the preference function. On the basis of such findings, Berlyne (1963; 1967) has suggested that expressed interest and preference are related to *specific* and *diversive* exploration respectively, *i.e.* whereas 'interesting' stimuli are those which tend to elicit specific exploratory behaviour, 'pleasing' stimuli are those which would have greater reward value in a situation of low-information input. Studies that have involved subjects exposing themselves to whatever stimuli they liked, which would appear to be an operational measure of liking (*e.g.* Hutt and McGrew, 1969; Duke and Gullickson, 1970), have not found any evidence of consistent preference for complexity. The finding obtained by Berlyne (1963) and Hoats, Miller and Spitz (1963) that LI, rather than MI patterns were chosen for prolonged viewing after three or four second exposure, Berlyne explains by supposing that, having had sufficient time to reduce uncertainty to a threshold level, subjects were in a position to select whichever pattern they found more attractive. This idea is supported by the fact that the least intelligent retardates in the Hoats, Miller and Spitz (1963) study, who would be expected to have taken longest to reduce uncertainty, made more MI choices than those more intelligent.

Berlyne (1960, chap. 8) did predict that exploratory behaviour should be related to scores on the Barron-Welsh Art Scale (Barron, 1953), a test designed to measure differences in complexity-simplicity preference. Although this had been shown not to be a unitary trait, just as complexity is not a unitary dimension (Rump, 1968), Berlyne and Lewis found a significant correlation of 0.32 between BWAS scores and numbers of MI choices (diversive exploration), while Day (1966b) found no correlation with the proportion of a thirty second viewing period spent on MI stimuli (specific exploration).

Increased attention to unfamiliar stimuli has similarly been interpreted as a 'preference' for novelty (*e.g.* Cantor, 1969), but there is considerable evidence to suggest that liking is correlated with familiarity rather than with novelty. Berlyne and Lawrence in their preference study found that subjects generally preferred figures which they had seen in previous experiments to new ones paired with them, but this area was not investigated systematically until Zajonc (1968) presented a large amount of data, both correlational and experimental, in support of the hypothesis that liking for stimuli increases as a function of their frequency of exposure. In the experiments he reported, subjects' ratings of the 'goodness of meaning' of nonsense words and Chinese idiograms, and favourable attitudes towards photographs of men's faces were all found to be enhanced after repeated presentations. Zajonc suggests that this effect is mediated by conflict reduction, an interpretation similar to Berlyne's account of specific exploration, except that it emphasises the effects of exposure on the perception of the stimulus rather than on the subject. Supportive evidence has been found (see Matlin, 1971).

Two studies with children by Cantor (1968; Cantor and Kubose, 1969) have demonstrated the opposite effect. Both studies found significantly greater liking for drawings which had not been seen previously. Faw and Pien (1971), using adults and ten to thirteen year olds as subjects, obtained similar results to Cantor's for both groups: unfamiliar drawings were rated more liked, regardless of whether they were meaningful or whether a spaced or massed familiarisation procedure was used. The authors suggest that Zajonc's results could have stemmed from his using stimuli that were initially difficult to distinguish from each other; reinforcement following successful discrimination would be expected to have enhanced subjects' attitudes towards those stimuli.

Berlyne (1970a) had groups of students rate coloured shapes (as used by Berlyne and Parham in their subjective novelty study) on seven-point scales for 'pleasingness' and 'interestingness'. Both were found to decline with repeated exposures, with 'interestingness' tending to fall off faster, and to increase with a change of stimulus. Berlyne attempted to reconcile conflicting results by proposing that changes in preference following exposure depend on changes in the arousal-potential of the stimulus. On this basis, he predicted that relatively complex stimuli, having an arousal-potential in excess of the optimal level, would become more liked as continued exposure produced arousal-decrement, whereas simple stimuli, having a sub-optimal level at the outset, would merely increase arousal further with continued exposure, resulting in increased negative affect. In a series of experiments, Berlyne found that complex paintings on the whole declined less in 'pleasantness' than simpler ones over ten four-second presentations, while there was some tendency for their ratings to rise when the familiarisation procedure involved the interspersed presentation of several stimuli (as used by Zajonc and his associates) rather than homogeneous sequences. In a further experiment, ratings of complex paintings were found to reach a peak after twelve presentations and then decline steadily with additional trials, while those of simple paintings showed a monotonic decrease.

Hutt's 'novel toy' studies (1970 a;b) provide evidence in support of Berlyne's hypothesis that whether or not the reward-value of a stimulus increases with familiarity depends on how 'interesting' the stimulus is initially. She found that when complex feedback from the object was available, the time that subjects spent in playing with it (*i.e.* diversive exploration) increased and then decreased over trials, as investigation of it (specific exploration) declined steadily; it was enhanced by wide spacing of trials, but it did not occur at all under simple or no feedback conditions.

2.1B Epistemic curiosity

'Epistemic' behaviour is defined by Berlyne (1960, chap. 10; 1966a) as a sub-class of specific exploration, particularly characteristic of humans, which is directed towards and reinforced by the acquisition of knowledge, 'that is, information stored in the form of ideational structures and giving rise to internal symbolic responses that can guide behaviour on future occasions'. (1966a, p. 31). The classes of epistemic behaviour listed by Berlyne are epistemic (*e.g.* scientific) observation, epistemic (original or creative) thinking, (see Berlyne, 1965; 1970b) and consultation, which includes reading and question-asking.

Such behaviour is thought to be initiated by, and aimed at resolving, a state of high arousal ('epistemic curiosity') resulting from conceptual conflict, ie. competition between incompatible thoughts, beliefs, attitudes or conceptions. Berlyne lists categories of conceptual conflict: doubt, perplexity, contradiction, conceptual incongruity, confusion and irrelevance. Although knowledge-seeking is differentiated from exploratory behaviour aimed merely at 'dispelling the uncertainty of the moment' (*ibid.*), the distinction between the two would not appear to be clear-cut if one accepts that exploration may be directed towards the formation of models or schemata of stimulus-events. Bruner (1966) has suggested that knowledge can be encoded in three different ways: by means of 'enactive', 'ikonic' or 'symbolic' representation. That is to say, one can know about the world through the habitual actions that are used in coping with it, through imagery, or through linguistic and other symbolic transformations of actions and image. It may be the case that much perceptual exploratory behaviour (see.2.1A) serves the function of acquiring ikonic schemata, particularly in young children whose representational capacities are limited, while the types of response classified as 'epistemic' are those which are aimed at forming or modifying symbolic schemata.

Two experiments by Berlyne (1954b; 1962) were designed to test four hypotheses proposed by the author in the earliest statement of his theory (1954a). It was predicted that conceptual conflict, and hence epistemic behaviour, would increase as a function of:

(1) the number of competing symbolic response-tendencies
(2) their total absolute strength
(3) their nearness to equality of strength, and
(4) their degree of mutual incompatibility.

In the first study, a group of students were given a questionnaire consisting of forty eight multiple-choice questions about invertebrate animals, and were asked to mark the twelve questions whose answers they would most like to know. The results showed that questions were more likely to be marked if:

(i) they concerned animals rated as more familiar; this was taken as support for hypotheses (1) and (2), on the assumption that beliefs and ideas about more familiar concepts would be both more numerous and stronger;

(ii) they had four rather than two alternative answers; this was taken as additional support for hypothesis (1);

(iii) they were found surprising, or if their predicates were judged to be inapplicable to the animals involved; this was considered to support hypothesis (4).

The later study was concerned with testing hypotheses (1) and (3), degree of conflict in this case being manipulated by varying stimulus-uncertainty. A group of sixteen year olds was presented with thirty quotations, each coupled with two or three names purporting (incorrectly) to include that of the author; each name in turn was coupled with a number which was alleged to be how many experts out of a group of a hundred had guessed it to be the correct name to match the quote. Uncertainty was varied further by varying the distribution of 'guesses' among the names; the more names there were, and the more evenly the guesses were distributed, the greater was the level of objective uncertainty. The thirty quotes were thus divided into high-, medium- and low-uncertainty groups. Subjects were instructed to rank-order the twelve quotes whose true authors they would most like to know. A 'curiosity score' of zero was allotted to unranked quotes, while the score for each one ranked was calculated by subtracting its rank from thirteen. It was found that the mean curiosity score was highest for the high-uncertainty quotes and lowest for the low-uncertainty quotes, lending support to both hypotheses.

A similar dependent variable was used by Ashton (1965) to investigate the effects of collative properties on epistemic curiosity in ten and eleven year old children. The subjects were asked to say which of the objects in a series of photographs they would like to know more about. Ashton reports that in the case of 'puzzle pictures' (common objects viewed from unusual angles), frequency of choice was correlated with judged complexity and novelty, though more so with the former, while with photographs of strange museum objects, there were no such correlations. Providing information increased frequency of choice when it appeared to conflict with the content of the picture, and decreased it when it merely defined or described the picture, thus reducing stimulus-uncertainty. Subjects tended not to choose pictures about whose identity they had been able to formulate a large number of hypotheses, which may be seen as an instance of conflict reduction through 'epistemic thinking'.

2.1.5 The stimulation of questions

Question-asking, it has been noted, is defined by Berlyne as an instance of 'consultation', *i.e.* 'behaviour which exposes an individual to verbal stimuli issuing from other individuals', (p. 265). N. Isaacs (Isaacs, 1930), in an essay on the 'why' questions of young children, stressed the role of conflict in motivating such questions, many of which, he suggested, could be classified as 'epistemic' why's (*i.e.* occasioned by a sudden clash, gap or disparity between our past experience and any present experience' (p. 295).

Berlyne and Frommer (1966) investigated the relationship between conflict-arousal and question-asking in groups of children aged five, eight and eleven. The subjects were presented with pairs of items representing high and low ('plus' and 'minus') values of collative variables, and were invited to ask questions about them. The stimuli consisted of pictures (varying in incongruity); pictures with or without explanatory stories (amount of information); orally-related stories with pictures, varying in the number and respective probability of possible outcomes (uncertainty) and tricks with 'magic' or 'normal' outcomes (surprisingness). Over all four categories, 'plus' items elicited significantly more questions than 'minus' items. The questions that were asked were categorised in terms of whether they requested factual or explanatory information, and whether they were in 'open' or 'closed' form. Open questions are those that are introduced by an interrogative word and which may receive a wide variety of answers, whereas closed questions minimally require only a 'yes' or 'no' answer. The latter type may be taken to indicate that the questioner has formulated a specific hypothesis that he wants confirmed or denied, while the former may, in general, represent a less knowledgeable stage of thinking. Open questions were more frequent at all ages; closed explanatory questions were only asked to any appreciable extent by the eleven year olds, almost all of them concerning the magic tricks. This category elicited significantly more explanatory than factual questions overall, while the 'amount of information' and 'uncertainty' categories, as might be expected, elicited more factual questions. In a pilot study employing slightly different materials, eight year olds asked many more questions than younger or older children (a mean of 23.0 against 3.7 and 9.4 respectively), while in the main experiment, the number increased monotonically with age (means of 6.9, 16.8 and 17.8); this disparity was attributed to the fact that the oldest children were already familiar with the stories used in the pilot study. Surprisingly, in both experiments, providing answers increased the number of questions asked only for the intermediate age-group, this effect attaining significance in the main study.

Duffy and Robinson (*ibid*) found that 'incongruous' drawings elicited significantly more questions than their banal counterparts, although the absolute numbers were small (a mean of 1.33 against 0.37). Furthermore, there was a significant negative correlation (r = 0.40) between amount of questioning and intelligence-test scores (Raven's matrices), while social class had no significant effect. Evans (1970) invited his subjects to record any questions they would like to ask about six paragraphs graded for complexity. More complex paragraphs did not elicit more questions, but as complexity increased, the proportion of subjects asking open questions increased significantly, while the proportion asking closed questions declined.

2.1.6 Curiosity-arousal and learning

A test of the effect of epistemic curiosity arousal on retention was carried out by Berlyne (1954b) in a later phase of the study cited previously. After the experimental group had seen the pre-questionnaire described earlier, they and a control group who had not had the questionnaire were given a list of seventy two statements about invertebrate animals, some of which were answers to the questions. This was followed by a retention test consisting of open-ended versions of the same questions in a re-randomized order. It was found, as predicted, that the experimental group scored significantly higher than the controls on the retention-test, and that statements which were recognised as answers to questions were more likely to be retained. In addition, questions which had aroused most curiosity were more likely to have their answers recognised and to be answered correctly in the test.

Berlyne's interpretation of these results seem puzzling at first glance:

> 'It had been postulated that the questions would generate epistemic curiosity, which would be relieved after subsequent exposure to the corresponding statements and internal rehearsal of them, and that reinforcement from the consequent curiosity reduction would increase the likelihood of recall when the questions were presented again during the test phase.' (1966b, *p.* 128)

If knowledge-rehearsal following epistemic behaviour does enable conflict to be resolved, then it should be expected to strengthen that behaviour. In fact, the experimental group did express more 'extended curiosity' than the controls at the end of the experiment: when asked to indicate which animals they would like to know more about, they checked off more animals (but compare the equivocal evidence obtained by Berlyne and Frommer). However, Berlyne's account seems to assume that arousal-reduction strengthens both the epistemic response and knowledge rehearsal. A more satisfactory interpretation may be one involving two-stage reinforcement process: conflict-reduction may act as the reinforcer for knowledge-rehearsal, while exposure to answers, by providing the opportunity for conflict reduction, may reinforce the epistemic response. It should be noted, however, that a different explanation has been proposed by Rothkopf (1965), who suggests that pre-questioning facilitates retention by eliciting 'inspective behaviours' which draw the learner's attention to relevant information. This interpretation and research relating to it are discussed by Prosser (chap. 9).

A further investigation by Berlyne (1966b) used materials similar to those employed in his 1962 study. The subjects, eleven and twelve year old girls, were presented with twenty eight quotations together with names of possible authors and experts' guesses as to which was the correct one. Again, uncertainty was manipulated by varying the number of possibilities and the distribution of guesses. For the purposes of the experiment, one author was assigned to be the 'correct' answer for each of the quotes: subjects were given this answer following exposure to the quotes, after which they received a retention test presenting the quotes in a re-arranged order. Contrary to prediction, neither retention nor extended curiosity scores were affected by the two uncertainty variables, but retention scores were significantly correlated with both extended curiosity and intelligence test scores ($r = 0.22$ in each case). Berlyne suggests on the basis of this that retention may be a joint function of intelligence and the individual's characteristic level of curiosity. Having to guess the answer for each quote before being given the 'correct' answer significantly improved recall, as did a delay between exposure to the quotes and receipt of the answers. The reason for this latter finding is not at all clear, but the 'guess' condition might have been expected to increase response-competition and thus raise the level of epistemic curiosity. Further evidence for the facilitating effect of prior guessing on learning is reported by Berlyne, Carey, Lazare, Parlow and Tiberius (in press).

A similar experiment to Berlyne's was carried out by Nicki and Shea (1971) who presented nine to eleven year old children with a series of twenty questions coupled with the correct answer or with two, three or five alternatives, one of which was correct. The respective probabilities of the answers were determined by the frequency with which they had been given when the questions had been presented in open-ended form to a different group of children. The procedure was basically the same as that followed by Berlyne: after the questions had been presented, the children were told the correct answers, and then underwent a recall test either immediately or twenty four hours afterwards. Unlike Berlyne, Nicki and Shea found a significant relationship between uncertainty and retention scores, although overall it tended to be curvilinear, recall scores being highest for questions with three alternative answers. This effect was more marked for immediate than for delayed recall, and more marked for middle- than for working-class children. Overall, the working-class scored lower than the middle-class, but the performances of the two groups was equal at the highest level of uncertainty.

Paradowski (1967) has also demonstrated improved retention following curiosity-arousal, using a completely different procedure. He presented groups of students with ten pictures, five depicting 'strange', and five 'familiar' animals, together with a paragraph of information about each. After inspecting the pictures and paragraphs for thirty seconds each, the subjects were given a recall test. Retention of both the information in the paragraphs and the settings and borders of the pictures was significantly superior for the group shown the 'strange' pictures. In a similar, but simpler experiment, Pielstick and Woodruff (1968) tested for recall of objects rated 'novel' and 'familiar' by seven and eleven year olds, both immediately and five weeks after the objects had been seen in an exploration study. Younger subjects recalled significantly more novel objects in both tests, while the older children showed some tendency to recall familiar objects better, even though both groups had initially spent longer in investigation of the novel objects.

It has been noted that on Berlyne's hypothesis, that uncertainty-reduction strengthens both knowledge and the response that produces it. The experiment by Nicki (1969) cited earlier, suggests that uncertainty-reduction may reinforce any response upon which it is contingent. A similar effect was demonstrated by Mittman and Terrell (1964); they divided a sample of six year olds into three groups on the basis of the number of correct responses (zero, fourteen or twenty nine) they were required to make in a discrimination task before the identity of a dot drawing could be made known to them. The group which had to wait longest made significantly fewer errors than the other two, while the group told the identity of the drawing at the outset made most errors. It thus appears that uncertainty-reduction was a sufficient incentive to enhance discrimination performance even though the relationship between the two was arbitrarily determined by the experimenters.

2.1.7 Epistemic curiosity: a re-interpretation

Similar ideas about epistemic behaviour and its relationship to learning have been expressed in different terminology in the theoretical formulations proposed by Piaget (1936) and Ausubel (1968), the former concerned with cognitive development in children, the latter with meaningful verbal learning in the educational context. Both assume that the individual's knowledge of the world consists of hierarchically organised internal representations of experience generally referred to as 'schemas' or 'cognitive structures', and that the acquisition of new knowledge involves modifications of these systems. However, Piaget is like Berlyne and unlike Ausubel in that he is interested in mechanisms of knowledge acquisition, stressing that organisms adapt actively to their environment; both see conflict as a basis of change. Ausubel is concerned less with whence and how potential knowledge comes into the organism's orbit of experience, but whether or not it can be assimilated once it is there, *viz.* what is relevant to the integration of knowledge, particularly that presented in verbal form. He says nothing about 'accommodation' except that it may be impossible.

Both Ausubel and Piaget write in terms of internal representations being cognitive structures, loading the organism with interpretive schemas. By contrast Berlyne honours his commitment to learning theory by writing in terms of response tendencies and problems of antagonism among these; conflict is a conflict about what to do. For Piaget conflict is a problem about what and how to think.

According to Piaget's biological model, each new cognitive transaction with the environment involves two complementary processes, 'assimilation' and 'accommodation'. 'Assimilation' refers to the interpretation of an object or event in accordance with the child's existing cognitive structure, while 'accommodation' refers to the process by which unassimilable properties of that object or event change internal representations allowing subsequent incorporation into those structures. In these terms, the types of behaviour labelled 'exploratory' and 'epistemic' can be regarded as different modes of accommodating to new experiences. A similar interpretation is suggested by Ashton (1965, chap. 5), when she describes questions as behaviour 'designed to remove obstacles in the path of assimilating objects into past experience'. Piaget supposes that cognitive structures, once generated by the child's experience, have an intrinsic need to continue functioning, and that accommodatory acts are continually being extended to new and different features of the environment. A newly accommodated-to feature will be assimilated to an existing structure; once assimilated, it will modify that structure, and make possible further accommodations. This process, together with spontaneous re-organisation of assimilatory structures occurring independently of environmental input, makes possible a series of progressively more stable states of 'equilibrium' between the child and the environment as his internal representations become an increasingly satisfactory match to reality.

This equilibration process is assumed to be an autonomous 'wired-in' one (a similar view is proposed by White, 1959). It has been pointed out by Berlyne (1960, chap. 11) and Ashton that the drive to attain higher levels of equilibrium would appear to stem from the individual's awareness of the inadequacy of his present knowledge in the face of some new input, and the attainment of a higher level functions to resolve conflicts arising out of perceived discrepancies; to use Bruner's term, Piaget's regards 'trouble' to be the mainspring of development. However, while this concept is used to explain major transitions in the course of intellectual development, the modification of cognitive structures clearly occurs at a molecular rather than a molar level – the child does not attain maturity in one single step. The gradualness of cognitive advances is explained by the hypothesis that one is only able to assimilate information for which one has been prepared by previous assimilations: An event whose interpretation requires a radical re-organisation or extension of existing structures cannot be successfully accommodated to, and hence assimilated, or in Ausubel's terms, the assimilation of new material depends on the availability of appropriate concepts to act as 'subsumers' for that material.

As Berlyne (1970a) points out, the model that Piaget proposes may have generality beyong the developmental sphere:

> 'It seems reasonable to suppose that similar factors will account for the initiation of a specific piece of thinking as well as the adoption of new overall strategies of thinking and the construction of the comprehensive systems of thought elements on which every specific thought process depends.' (*p.* 968)

Ausubel makes a similar point, though with a rather different emphasis:

> ' A moderate amount of discrepancy, incongruity or gap between existing knowledge and a new learning task is most effective in mobilising attention, particularly when the learner is dissatisfied with what he knows. In J. Piaget's terms, a child is most attentive to new learning tasks when they require some degree of accommodation on his part before they can be assimilated – when existing schemas are not wholly adequate for understanding or problem-solving and require some but not too much modification.' (1968, *p.* 371)

What Ausubel is proposing here would appear to be an instance of a discrepancy hypothesis; not only is the individual's ability to assimilate new material determined by its 'remoteness' from his existing knowledge, but his desire to do so is also. If this is the case, then it may be predicted that the likelihood of epistemic behaviour being elicited by any given material will be a curvilinear function of its remoteness. However, the problems of defining amount of discrepancy in operational terms are likely to be at least as great as they are with respect to exploratory behaviour.

2.2 Curiosity as Behaviour : Exploration and Questions

Exploratory Behaviour in Children

The studies of exploratory behaviour cited in the previous section were concerned primarily with manipulating stimulus variables. Although subject variables were also taken into account, they were considered mainly with respect to differential attentiveness to stimuli of high and low collative variability. The research to be described in this section places greater emphasis upon personal antecedents of exploration, and particularly upon aspects of mother-child interaction. Also, they tend to operationalise exploratory behaviour in more global terms than mere visual fixations of specific stimuli. In some cases, the amount of investigation exhibited by subjects in an experimental situation has been regarded as an operational measure of the trait of curiosity; the extent to which this assumption is justifiable will be discussed in the following section (3.3).

2.2.1 Factors influencing exploratory behaviour

Personal adjustment. As described earlier, evidence on the relationship between measures of anxiety and responsiveness to collative stimuli is equivocal, despite the theoretical grounds for supposing that this relationship should be a negative one. McReynolds, Acker and Pietila (1961), on the basis of McReynolds' theory (1956), hypothesised that anxiety would inhibit the assimilation of new percepts to perceptual schemata, and this in turn would inhibit exploratory behaviour. The procedure of their experiment was similar to that used by McReynolds (1958) with psychiatric patients. The dependent variable was the number of manipulations of thirty five small objects; twelve of these were presented singly, and twenty three were presented in an ensemble for ten minutes. The subjects, eleven year olds, were rated by a teacher on six-point scales for 'psychological health' and for five aspects of 'maladjustment'. Exploration scores correlated 0.45 with psychological health and from -0.27 to -0.50 with the maladjustment ratings.

However, Medinnus and Love (1965) found no relationship between teacher ratings on six aspects of 'security' and exploratory behaviour in four year olds. The dependent variable in this case was the amount of manipulation of twelve small toys and objects, and the number of times subjects chose an unseen toy in preference to a visible one on eight trials. Saxe and Stollak (1971) found teacher-ratings of anxiety to be unrelated to six measures of exploration in a free play situation in five year old boys.

Maternal attention. Rheingold (1961) compared the visual and manipulatory responsiveness to a novel toy (a rattle) of three month old institution- and home-reared babies. Prior observation revealed that the home-reared group received more maternal attention, while the institution group received attention from a larger number of different handlers. There were no significant differences between the two groups in four measures of exploration, although the institution babies were more responsive socially.

Rubenstein (1967) hypothesised on the basis of Rheingold's and other findings, that the period between three and a half and six months of age is a critical one for the emergence of a relationship between levels of environmental stimulation and exploratory behaviour. Accordingly, she distinguished three groups, judged to be receiving high, medium and low levels of maternal attentiveness, on the basis of home observations made when the children were five months old. Measures of exploration, obtained at six months, consisted of the time spent looking at and manipulating a bell presented alone for ten minutes, and following this, ten novel objects paired with the bell for one minute each. The high-attentiveness group were significantly superior to the low-attentiveness group on the first test, and to both other groups on the second. However, Rubeinstein's hypothesis is put in question by the results of an experiment by White and Castle (1964), in which the attentiveness variable was manipulated experimentally. A group of infants from an institution were given two minutes extra handling a day during the first five weeks of life. They subsequently exhibited greater general visual attentiveness than a non-handled group; the largest difference occurred at about six weeks of age, after which the performance of the two groups became more similar. This enhancement effect was apparently not mediated by superiority in general physical condition: there were no differences between the two groups in the development of prehension, gains in weight, or in general health. In this study, the independent variable was defined precisely as the amount of physical contact between mother and child, whereas in the Rheingold and Rubenstein studies, this variable was confounded with the general level of environmental input with which the child was provided. It seems likely that these two factors may affect subsequent exploratory behaviour differentially, and also may interact differentially with time of occurrence.

Parental attitudes. Moss and Robson (1968) had raters assess expectant mothers on two nine-point scales, relating to the degree to which they saw their babies in a positive sense and their interest in affectionate contact with infants. Scores on the two scales predicted the amount of face-to-face contact between mother and child at one and three months of age, but they failed to predict the length of fixations shown to geometrical patterns and facial representations at three and a quarter months. At the same time, girls' fixations to the facial stimuli were significantly correlated ($r = 0.61$) with amount of face-to-face contact at three months.

Using the McReynolds *et al.* test, and projective-tests designed to tap children's perceptions of parental behaviour, Pangrac (1969) found that nine year old girls who scored low on exploration, significantly more than those who scored high, tended to perceive their parents as high on love and autonomy-granting, and low on hostility and control. Similar tendencies were found for boys, but not to a significant extent. Exploratory behaviour was unrelated to intelligence, social class, and family size, but first-born girls appeared in the high exploration group significantly more often than laterborns. Given that the effects of parental attitudes on child behaviour are probably mediated through the parent's behaviour towards the child, the results of this study seem difficult to reconcile with those of the studies described above. And it seems to be impossible to come to any conclusions about these more distal antecedents of exploratory behaviour.

2.2.2. Children's questions

If asking questions is a response to discrepancies between past and present experience, it should be possible to find relationships between patterns of questioning and such 'developmental' variables as age, intelligence and sex. Some evidence for such relationships is available from the Berlyne-based studies described in the previous section, but the ability and disposition of a child to seek knowledge in any situation should be expected to depend upon the complexity of the situation or relationship about which knowledge is sought and his capacity to appreciate this complexity.

The classification of questions: Piaget and Isaacs. Piaget (1924, chap. 5) collected nearly 1,000 spontaneous questions asked by a six year old boy over a ten month period, mostly recorded in the course of afternoon walks with a nurse. The object of this was to uncover the boy's transition from pre-causal to causal thinking. At first, only 'why' questions were recorded; these were categorised in terms of what sort of information was requested, the principal categories being causal and final explanation, human motivation, and justification of customs and rules. In later sessions, other types of questions were also recorded; these were classified as questions of causal explanation, reality and history, human actions and rules. Piaget's scheme was applied to the data of a number of the early studies of individual differences in questioning described below.

Unlike Piaget, N. Isaacs (1930) emphasised the functional similarity of 'why' questions across age-levels. He suggested an alternative classificatory system for young children's why's in terms of their motivational antecedents rather than their reference. Mention has already been made of the class of 'epistemic' whys, which were seen as aimed at reducing conflict and preventing its recurrence. Isaacs also distinguished 'affective and expressional' (*i.e.* apparently not requiring an answer), 'informational' and 'justificatory' 'why' questions. Clearly, the two schemes, approaching questions from different viewpoints, are not necessarily mutually incompatible.

Studies of spontaneous questions. Fahey (1942) has reviewed a number of early studies, usually involving fairly informal observations of a single child and concerned with the age of initial appearance of various interrogative forms. In general, they seem to indicate that 'why' questions emerge later than other open forms, but as Fahey points out, many questions in early childhood are requests for goods and services rather than for information, and the results of these studies are likely to reflect the order in which these demands appear rather than cognitive maturational processes. Some of the studies reviewed also traced age-changes in the proportion of children's conversation devoted to questioning, or noted the age at which questions were most frequent; the overall indication is that the amount of questioning increases up to a maximum at about four years of age, after which it gradually declines. Summarizing these results, Stern (1924) distinguished two developmental phases; the first, commencing in the second year, was considered to be characterized by questions of name and place, the second, lasting from the age of three to seven years, by questions of time and cause.

Two larger-scale studies were carried out in the 1930's. In the first of these, Davis (1932) had mothers record fifty consecutive questions from three to twelve year olds. While very large individual differences appeared – the time taken to collect the questions ranged from thirty minutes to over fourteen hours – age had no significant effect on rate of questioning, though the main length of questions did tend to increase, as did the frequency of questions about human actions and intentions, and questions requesting corroboration and approval. Boys asked questions at a faster rate than did girls, while those that the girls did ask were longer at all ages. Boys asked more open questions, more 'why' and more questions about definitions and causal relationships, while girls asked more about social relationships. Davis reported that eighty eight per cent of questions seemed to stem from the immediate situation, eleven per cent from remote events; she also concluded that while a novel occurrence seemed most likely to elicit a long series of questions, any ordinary situation might serve as a starting-point.

Smith (1933) observed children aged from one and a half to six years in two situations, namely alone with adults and playing with peers. Her results tended to confirm earlier findings: the proportion of conversation occupied by questions was greatest at four years; 'what' and 'where' questions declined in frequency with age, while 'how', 'when' and 'why' increased steadily from year to year. Also, the relative frequency of closed questions increased. At two years, about a half were open, while by five years only a third were. There were no sex differences in questioning frequency overall, though girls asked nearly twice as many as boys at two years. A similar difference at this age level was reported by McCarthy (1930), and might be attributable to earlier speech acquisition in girls (see Maccoby, 1967, *p.* 334-336). Significantly more questions were asked of adults than of other children, though the difference tended to decrease with age. McCarthy also compared questioning frequency among nursery-school children of high and low socioeconomic status, and found that the percentages of conversation devoted to questions were fourteen and seven respectively.

Elicited questions. A number of experiments have involved subjects being presented with some materials and invited or instructed to ask questions about them. The incidence and types of questions asked have been measured against subject variables, but in view of the wide variety of elicitation procedures used, consistent results would not be expected.

Two early investigations cited by Fahey, by Mau (1912) and Finley (1921), were concerned with sex and age differences respectively. Mau used nature study materials to elicit questions from kindergarten and young school children, and found that boys asked more than girls, nearly all questions being concerned with the names and activities of objects. Finley elicited more than 8,000 written questions from children aged between eight and thirteen by showing them a 'mud-puppy' (a species of salamander) in their classrooms. He reported a decrease with age in the numbers of teleological questions asked, with a corresponding increase in the incidence of questions about structure. Attempts at classifying the animal were rare, especially among the youngest children. Finley also found that children remembered best those points about which they had asked most questions.

Berlyne (1970b) cites an experiment by Stirling (1937) in which pre-school children were exposed individually to a variety of pictures and stories, about which they were invited to ask questions. Older children asked more questions, and requested information about a larger number of items; they asked more about purposes, times and places, and fewer about names and attributes of objects. The incidence of questions was also positively related to indices of intelligence and social class.

Yamamoto (1962) gave Torrance's (1962) 'Ask-and-guess' test to subjects aged from five to seventeen, and also to a group of adults. The test involved showing subjects pictures illustrating nursery rhymes, and instructing them to think of as many questions about them as they could that were not answered in the pictures. It was found that the number of questions asked tended to increase with age, though sharp dips occurred at about nine and twelve years. Categorising the questions according to the interrogative word used, Yamamoto found that between five and eight years of age, 'why' accounted for seventy per cent of all responses; their relative frequency dropped sharply at nine, remaining stable thereafter at about thirty per cent, still the largest single category. At the same time, 'what' rose from less than ten per cent to more than twenty per cent, 'how', 'where' and 'who' showed the same tendency, but to a lesser extent. Closed questions increased steadily with age. These results were interpreted as indicating a transition from 'global' through 'specific' to 'definitive' questioning: young children ask unspecified questions in lieu of, or in preparation for, making specific hypotheses; later, they test partially-formed hypotheses by asking specific questions, and finally, they try to confirm hypotheses by asking definitive questions. It was suggested that the two dips that were found reflect transitions between stages. Although this developmental hypothesis seems to be a plausible one, Yamamoto's results cannot be taken as reliable evidence in support of it, since the subjects were asking questions as a task requirement rather than to reduce uncertainty. It is not surprising that their capacity to ask 'deeper' questions increased with age; Mosher and Hornsby (1966) and Duffy (*ibid.* chap. 3) have shown that older and more intelligent children are better able than those younger and less intelligent to frame appropriate 'yes-no' questions to solve problems in a 'Twenty questions' situation.

A study of Aikawa and Horiuchi (1962) was concerned with the topics of 'why' questions solicited from 1,000 children aged between seven and fourteen. Questions about human life increased in frequency with age, while questions about things, animals and plants decreased. The total number asked reached a peak at eleven, after which it declined. Within a single age-group, Ashton (1965) found that children who asked many questions also asked high proportions of closed relative to open questions, and of questions with conceptual rather than perceptual content. Questioning patterns were, however, unrelated to intelligence.

To the extent that the results of these studies are comparable, they show a fairly consistent picture with respect to developmental changes in questioning; the findings of Smith and Stirling are consonant with the idea of two 'questioning ages' in early childhood, while those of Finley and Yamamoto lend some support to the notion that children become responsive to more complex discrepancies as they become older. The tendency for boys to be more inquisitive than girls may stem from sex-role development rather than from purely cognitive factors; in Yamamoto's study, where asking questions was merely set as a problem for subjects to work at, no consistent sex differences appeared.

Two studies by Torrance have involved attempts to enhance questioning performance in structured situations. In one (1970a), groups of five year olds comprising four, six, twelve or twenty four members were asked to produce as many questions as they could in a 10-minute period in response to 'Ask-and-guess' items. The two smaller groups asked significantly more questions, more 'discrepant event' questions, and fewer repeated questions than the two larger groups. Later (1970b), six-member groups of six year olds were presented with various toys, and instructed to ask a large number of questions about them. Groups who were given an opportunity to manipulate the toys exceeded those for whom the toys were merely demonstrated in the numbers of questions asked and also in the numbers of 'good' questions, *i.e.* whose answers were not immediately obvious.

Classroom questions. Questions asked by children in the classroom have generally been studied for immediately practical pedagogical purposes, usually with a view to improving teaching methods to encourage pupil participation, or to changing curriculum content in such a way as to bring it into line with pupils' interests. Again, little consistency of results is to be expected, for in addition to all the uncontrolled variables that necessarily obtain in the classroom, the conditions under which data were collected vary a great deal from one study to another: in some cases, apparently spontaneous inquiries were recorded, while in others, the classroom situation was manipulated in such a way as to elicit or encourage questioning. All the investigations reviewed here were carried out in American schools.

It appears that the proportion of pupils who ask questions in class is small. Fahey and Corey (1941) had observers record all the questions asked by children in a number of high school classes in the course of a year. A third of the sample asked less than six during the year, and many of these asked almost none; four per cent of pupils accounted for twenty five per cent of the questions. More recently, Davis (1971) found that only thirty eight per cent of fourth and sixth grade pupils asked questions in social studies discussions; in a typical classroom, she reports, three children accounted for half of the questions, while five accounted for more than three-quarters.

Some of the studies cited by Fahey concerned individual differences in frequency of questioning. Pollock (1924) collected 3,500 questions about general science, and compared those asked by high and low stream thirteen year olds; he reported that the 'interest-span' of the former was seven per cent greater than that of the latter, while the interest-span of girls was ten per cent greater than that of boys. Gatto (1929) collected over 4,000 questions asked by 400 children; half of these requested repetitions of previously presented facts, twenty per cent requested new facts, and six per cent implied some causal reasoning. All these types occurred with approximately equal frequency in different lessons, and among different age and ability groups. Fahey and Corey (*op. cit.*) found that questioning frequency tended to be curvilinearly related to intelligence and achievement variables, with children who scored very low on these asking many questions. At all levels, some children asked almost none. Pupil variables bore no significant relationship to types of questions (in terms of Piaget's categories) or to their judged complexity.

More recently, Dorn (1967) found that children in two kindergarten schools asked very few questions of their teachers, most of those that were asked being inquiries about matters of routine rather than requests for new information. Middle-class children asked more than working-class children, who evidenced a greater need for names of objects.

Pritchard (1970) reported high correlations between IQ scores and the number and quality of questions asked in sixth Grade social studies discussions. 'Evaluative' and 'analytic' questions were most strongly correlated with intelligence, while the numbers of 'creative' questions were curvilinearly related to it.

2.3 Curiosity as a Personality Trait

It has been widely assumed that curiosity can be conceptualised as an organismic variable or disposition, having 'stability over time and generality across situations.' (Livson, 1967, *p.* 73). Thus, individuals may be described as being characteristically more or less 'curious' than others. 'Curiosity' may be used to refer to behaviour directly or to a motivational disposition, *i.e.* persons may differ with respect to the frequency with which they manifestly exhibit various kinds of curiosity behaviours or the supposed level of some unobservable drive or desire to seek information or knowledge. The distinction is implicit in Ashton's definition of a more curious person as one whose curiosity is more easily provoked and who seeks more information about the same stimuli. She also points out that individuals may differ qualitatively in their curiosity, preferring different modes of information-seeking and requiring different kinds of information.

A number of attempts have been made to measure individual differences in curiosity. These are mentioned under three main headings: operational (or behavioural) measures, teacher-ratings and self-rating instruments. Particular emphasis is laid on evaluations of their reliability, or internal consistency, and on their validity, or the extent to which they are consistent with other logically related criteria. The possibility of a general personality factor of curiosity and personality correlates of measured curiosity will also be discussed.

2.3.1 Behavioural measures

Ashton's study was concerned with the measurement as well as the elicitation of curiosity. Her test was a development of one used earlier by Maas (1959) and Alabi (1959), in which children were presented with twenty museum objects together with varying amounts of information and asked to rate how much more information they would like to have about each one. Maas had found these scores were related to ratings of 'interest' in some topics. Ashton used photographs of museum objects as stimuli, and four behavioural measures: time spent looking at the photographs, the number of hypotheses offered about the identity of the objects, the number of photographs about which further information was requested, and the number of questions asked about them. Scores among these were positively correlated, though in some cases only moderately so. In addition, children with high scores on the four measures tended to give more reasons of difference from, rather than similarity to, past experience for their choices — in Ashton's terms, they were 'curious' rather than 'interested' — and they made more comparisons of both similarity and difference between pairs of pictures. It was hypothesised that a high level of curiosity was related to good concept-formation, narrow category-width, and an analytical, as opposed to a global mode of perceiving and thinking, in turn presumed to be dependent upon that cognitive style described by Witkin (1962) as 'field dependency'. Only IQ and looking time were in fact associated. Ashton suggested that looking and hypothesising reflected the ability to integrate new information; the primary process of information-seeking, as measured by the other two response measures, was considered to be independent of intellectual capacity. The evidence with which Ashton supported her ideas about the origins and nature of curiosity is too detailed and complex to be discussed here. While these appear to merit further empirical study, the validity of her test as a measure of curiosity must be doubtful on account of the absence of relationships to external criteria.

2.3.2 Teacher ratings

A number of the studies cited above have attempted to evaluate their behavioural measures of children's curiosity by having teachers rate or rank-order the children for the same trait. Medinnus and Love (1965), Maas (1959) and Alabi (1959) found no relationship between such ratings and other variables; in Alabi's study, they were strongly related to IQ scores. On the other hand, McReynolds *et al.* (1961) reported a correlation of 0.37 with their exploration measure, and Day (1968) found that pupils ranked in the top quartile scored significantly higher on the specific curiosity test than those ranked in the lower quartile.

In a long series of studies, W.H. and E.W. Maw have made extensive use of teacher-ratings, in conjunction with peer- and sometimes self-ratings, with samples of children of about eleven years of age. These studies have involved attempts to validate tests assumed to measure curiosity, and to discover what other personal characteristics are related to curiosity. Since the Maws' standard procedure for selecting high and low curiosity groups (Maw and Maw, 1961; 1964) has been employed frequently, it is worth describing in some detail. Teachers are first presented with a global definition of 'curiosity', derived from everyday and psychological usage and dictionary definitions. According to this, a child manifests curiosity to the extent that he

(1) reacts positively to new strange, incongruous or mysterious elements in his environment by moving towards them, by exploring them, or by manipulating them;
(2) exhibits a need or desire to know more about himself and his environment;
(3) scans his surroundings seeking new experiences;
(4) persists in examining and exploring stimuli to know more about them.

The teachers are told that the more of these activities a child exhibits, the more curious he is; they are instructed to rank-order the children in their class, starting with the highest, then the lowest, then the second highest, and so on. Maw (1968) reports a reliability coefficient for teacher-ratings of 0.77.

To obtain peer-ratings, children are presented with paragraphs, four describing high-curiosity and four low-curiosity characters, and they are asked to indicate which children in their class would be best suited to play each part. The scores assigned to each child is the weighted sum of the number of times he is listed. Maw and Maw (1964) report a correlation of 0.54 between these scores and teacher-ratings.

Pooled teacher- and peer-ratings are associated with by sex (boys tending to be rated higher than girls) and IQ (r = 0.36); these variables have been controlled for by the following procedure:

(1) Children are divided into groups by sex.
(2) Teacher- and peer-ratings of each sex group are correlated with intelligence scores.
(3) Regression equations for ratings on IQ are calculated for each group.
(4) Groups of boys and girls whose scores fall at least one standard error above or below the regression lines on both sets of ratings are selected as the criterion groups.

In two validation studies reported by Maw and Maw, high curiosity, relative to low curiosity children have been found to express greater interest in (though not greater liking for) asymmetrical rather than symmetrical patterns (1962a), and greater preference for various types of investigatory activity in response to twenty six questionnaire items (1965b).

2.3.3 Self-rating scales

Maw and Maw (1968) tested a self-report inventory based on their definition of curiosity. It listed forty one items, and children were required to mark on a 4-point scale (never/sometimes/often/always) the extent to which each item reflected their own behaviour. The scale had a split-half reliability of 0.91. High-curiosity criterion groups scored significantly higher than low-curiosity groups, but also, boys scored consistently higher than girls. Rosenshield (1968) carried out an extensive validation study of the test with ten and eleven year old boys, comparing the performance of subjects scoring in the upper and lower quartiles on a number of behavioural measures. In summary, his results indicated that high-scorers, relative to low scorers

(1) were more willing to expend energy in various activities;
(2) would spend more time in trying to solve problems;
(3) showed a greater preference for complex shapes;
(4) did not offer more ideas concerning the nature of an unknown object;
(5) did not ask more questions about various topics;
(6) did not show more readiness to give up a preferred object for an unknown one, but did indicate more willingness to part with a valued possession in order to acquire various items about which some information was provided;
(7) expressed a greater desire to learn about things with which they were unfamiliar.

It is noteworthy that two of the measures which failed to produce significant differences ((4) and (5)) were among Ashton's criteria of curiosity.

Penney and McCann (1964) devised a 'reactive curiosity' (RC) scale for use with children aged from nine to twelve. Following Berlyne, reactive curiosity is defined as a tendency to approach and explore relatively new stimulus-situations and incongruous or complex stimuli, and to vary stimulation in the presence of frequently experienced stimulation. The scale consisted initially of ninety 'true or false' statements, together with a ten-item lie scale; a revised version comprised the forty items which discriminated best between the upper and lower quartiles. Two-week test-tetest reliabilities ranging from 0.65 to 0.78 were found for various subgroups in a sample of nine and eleven year olds. Scores were not significantly affected by age or intelligence, but contrary to the Maws' findings, girls scored significantly higher than boys. On the assumption that curiosity is related logically and empirically to originality of thinking, the authors tested the scale's validity against scores on the Unusual Uses Test (Torrance, 1962), which requires subjects to write down as many uses as possible for a number of everyday objects. For the older children, RC scores correlated 0.32 with numbers of appropriate responses given on the UUT, and 0.44 with originality of responses. No such correlation appeared for the younger group; this the authors attribute to writing difficulty. Peters and Penney (1966) report a further validation study in which high and low RC groups were instructed to draw a line down the alley and into either arm of a pictorial 'T' maze. The high group were found to alternate arms significantly more often than the low group.

Penney and Reinehr (1966) have also developed a corresponding scale for adults. This was called the 'Stimulus-variation seeking scale' (SVSS), and consisted of 100 'true or false' items based on the same definition as the RC scale. It had one-month test-retest reliabilities of 0.84 for males and 0.87 for females. Scores were unaffected by sex, but were moderately correlated with IQ for males. High scorers were found to be more sensitive to the autokinetic effect, and the test correlated with both fluency and originality scores on the UUT (r = 0.47 and 0.27 respectively). In addition, Penney and Reinehr report a study in which subjects were left individually for fifteen minutes in a room containing objects rated as low, medium or high in their curiosity-arousing potential. SVSS scores correlated –0.59 with time spent inspecting low-rated objects, –0.55 with inspection-latency, and +0.59 with total exploration time.

Pearson (1970) suggested that 'novelty-seeking', which the Penney scales purport to measure, is not a unitary dimension. Accordingly, she devised four scales, each consisting of twenty 'like-dislike' items, designed to measure different aspects of the trait. These were described as:

(a) External sensation: a tendency to like active physical participation in 'thrilling' activities;
(b) Internal sensation: a tendency to like the experience of unusual dreams, fantasies or feelings;
(c) External cognition: a tendency to like finding out facts, how things work, and learning how to do new things;
(d) Internal cognition: a tendency to like unusual cognitive phenomena which are focussed on explanatory principles and cognitive schemes.

Pearson also constructed a ten-item 'desire for novelty' scale, which related to 'the wish for new experience and acknowledgement of the boring nature of the status quo'. Reliabilities for the five scales ranged between 0.76 and 0.87. The EC scale correlated 0.36 with the IS scale and 0.50 with the IC scale; otherwise, no significant interrelationships appeared. While these findings cast some doubt on the general validity of global measures such as Penney's, it should be noted that of Pearson's scales, only EC and IC appear to relate to curiosity as defined for example, by Maw and Maw, and these were positively correlated with each other.

2.3.4 Relationships among measures of curiosity

The evidence reviewed above lends little support to the commonly held notion that curiosity can be characterised as a unitary dimension of personality. This negative conclusion is borne out by the results of a detailed study by Langevin (1971) in which a wide variety of curiosity measures were compared. Langevin developed a set of materials relating to forty experiences which had been selected out of a pool of 155 by a sample of eleven year olds as those which they would most wish to have. The original pool of items was selected so as to represent as far as possible each sense modality and each area of academic study. To these forty, the seven least selected experiences were added to provide a check on validity. A list of these forty seven experiences was presented to a new sample of eleven year olds, who were instructed to rate their desire for each one on a three point scale (very much/somewhat/not at all). Next, each subject was given an opportunity individually to investigate and ask questions about the five items rated highest by him, plus three items selected at random, which were added to provide unbiased norms.

Thus, the test yielded three scores for each subject, 'experiential curiosity' (EC), exploration-time and number of questions. EC scores had a six-week test-retest reliability of 0.57, exploration-time and number of questions had split half-reliabilities of 0.62 and 0.67 respectively. Langevin tested for correlations among scores on these three measures, scores on four previously used curiosity measures, and scores on two intelligence tests. The other tests used were:

(1) Specific curiosity scale (Day, 1968b);
(2) Reactive curiosity scale (Penney and McCann, 1964);
(3) Teacher-ratings of curiosity, following the Maws' (1961) procedure;
(4) Test of specific curiosity (Day, 1968a);
(5) Otis Mental Aptitude Test;
(6) Raven's Matrices.

The main results obtained were as follows: EC correlated with the Day and Penney scales (r = 0.35; 0.39); the two behavioural measures, exploration-time and number of questions, failed to correlate with any of the pencil-and-paper measures, and only slightly with each other (r = 0.23); number of questions correlated slightly (0.17) with teacher-ratings, which were more strongly associated with intelligence test scores than with any of the curiosity measures (r = 0.35 with Otis, 0.32 with Ravens, 0.20 with the Day scale); TSC correlated only with the Penney scale, which was itself quite highly correlated with the Day scale (.52), this being attributable at least in part to a considerable item-overlap; apart from being associated with EC, the two inventories were also correlated with Otis scores (0.31; 0.22). Other findings of interest were that older children explored longer and asked more questions, and that girls expressed a broader range of interests in the EC test, but asked fewer questions than boys.

Factor analysis of the correlations yielded two weak curiosity factors, labelled 'Breadth of interest curiosity' with it's highest loadings on the Day and Penney scales and EC, and 'Depth of interest curiosity', with highest loadings on exploration-time and number of questions. Teacher-ratings loaded highest on an 'Intelligence' factor. Two main points of interest emerge from these results. The first is the marked discrepancy between the behavioural and the self-report measures. Although self-report measures have been validated against behavioural criteria when extreme-scoring groups have been compared, their ability to predict behaviour reliably appears to be extremely limited. Secondly, the results confirm that teachers are strongly influenced by the 'intelligence' of their pupils when assessing their curiosity. This is hardly surprising; brighter children should be better equipped to express interest in the school curriculum, and studies of classroom questioning generally suggest that they do. It does not seem justifiable to conclude, as Langevin does, that 'teachers misidentify the brighter child as the curious one' (*p.* 369), since there is no firm evidence that the 'curious' child exists.

Although a general factor of curiosity may exist, the overriding impression gained from this study and the others reviewed here is that the psychometric approach to curiosity has not proved to be a very fruitful one. It may not be too extreme to say that the statement 'A is more curious than B' is meaningless unless one specifies what he is more curious about.

2.3.5 Correlates of measured curiosity

Bearing in mind the qualifications mentioned above, and that the various measures described at best measure different aspects of curiosity, the present section reviews investigations aimed at finding personality correlates and developmental antecedents of individual differences in curiosity. These are discussed under the three headings of creativity, personal and social adjustment, and parental attitudes.

Creativity. Recent years have seen a rapid growth of interest in 'creative ability' conceived of as a trait distinct from general intelligence, and in the practical desirability of fostering creativity as an educational objective (for a general review, see Butcher, 1968, chap. 4). At the same time, numerous instruments have been developed which have been designed to measure such traits as 'creativity', 'originality' and 'divergent thinking' (Golann, 1963; Arasteh, 1968). Although these abilities do not appear to form a unitary dimension, or to be altogether independent of the abilities measured by intelligence tests (Ausubel and Robinson, 1969, chap. 17), it has been suggested (*e.g.* by Day, 1968b) that one of the pre-conditions for creativity is a high level of curiosity. Indeed, Torrance's Ask-and-guess test, designed as a test of 'creative thinking' (Torrance, 1962), includes a question-asking task, and is rather similar to Ashton's curiosity test. However, it has already been noted that Pielstick and Woodruff (1968) found it to be unrelated to measures of exploration.

It seems quite feasible to suppose that individuals who are disposed to seek novel experiences should be better able to produce novel outputs, and a study by Houston and Mednick (1962) lends some support to the notion. They distinguished high and low groups in terms of scores on the Remote Associates Test, in which subjects are presented with three apparently unrelated words, and required to find one further word linking them all together. The two groups were presented with a series of word-pairs each consisting of a noun and a non-noun, and asked to choose the word they preferred. The choice of a noun was followed by the presentation of a word which was an uncommon association to that noun, while non-noun choices produced common associations. The proportion of noun choices significantly increased over the series for the high group, while the low group significantly increased in their frequency of non-noun choices.

The Barron-Welsh Art Scale has been used widely as a measure of creativity; preference for more complex and asymmetrical figures has been found to predict original achievement in arts and sciences (Barron, 1963), and Golann (1962) found that high scorers also scored high on a questionnaire test of 'creativity motivation'. Eisenman (1969) found correlations of 0.27 and 0.38 between BWAS scores and fluency and originality scores on the UUT, which Penney and McCann found to be related to reactive curiosity. There is no firm evidence that complexity preference is related to exploratory behaviour (Day, 1966b), but Day (1968a), in two studies found it to be slightly correlated ($r = 0.22; 0.14$) with interest-in-complexity scores on the TSC.

Weintraub (1968) selected a sample of twelve ten-year old boys, six at each extreme of the curiosity scale in terms of the Maw and McReynolds criteria. He reports that the high curiosity boys were consistently judged more creative and flexible in their thinking by both teachers and parents. Maw and Maw (1965a) found high curiosity children to score higher than low curiosity children on the UUT and on originality of word associations. In a later factorial study employing a word association test and a battery of personality inventories (1970b), they found positive loadings for high curiosity boys on 'restrained' and 'impulsive' creativity factors; low curiosity boys showed negative loadings on these, but showed a weak positive loading on a 'concrete' creativity factor. However, in view of the limitations of both curiosity and creativity criteria, such conclusions must be treated with caution.

Personal and social adjustment. To add to the conflicting evidence relating to exploratory behaviour and anxiety, Penney (1965) reports that high Reactive Curiosity scores were associated with low scores on the Children's Manifest Anxiety scale, while Penney and Reinehr found no such relationship between the adult versions of the two scales. Weintraub found that high curiosity boys, although rated as less anxious by parents and teachers, did not obtain lower scores on the CMAS.

The high curiosity boys in Weintraub's study were also judged by parents, teachers and peers to be more socially skilled, and to exert more leadership than low curiosity boys, a finding corroborated by Maw and Maw (1965a), who used a variety of pencil-and-paper tests to measure various aspects of personal and social adjustment. The California Test of Personality, the Behaviour Preference Record, the Children's Personality Questionnaire and the Institute of Child Study Security Test were used to yield several scores each; to measure one variable each the authors used the Cassell Group Level of Aspiration Test, a social attitude scale, a social distance scale, a descriptive word test to measure morality, the Children's Manifest Anxiety Scale, the General Anxiety Scale for Children, the Children's Anti-Democratic Scale, and an intolerance of ambiguity test.

Overall, high-curiosity children tended to score higher on these measures, but differences were not always consistent across the sexes, with high-curiosity boys differing in many ways from their female counterparts. The Maws summarize the curiosity-group differences as follows: high curiosity children (both boys and girls) have a higher level of self-acceptance, seem to be more self-sufficient, tend to feel more secure, to be more dependable and honest and to show a higher level of group loyalty, exhibit a healthier participation in group activities, show a higher level of social skill and responsibility for group welfare, and show better overall social adjustment; high-curiosity girls have a higher level of aspiration and show a higher degree of responsibility; high-curiosity boys show a higher level of emotional maturity, are more free from social prejudice, feel that their discipline is more fair, and are better in their overall adjustment.

In a later study (1970a), Maw and Maw found that high-curiosity boys scored higher than low-curiosity boys on a number of measures of self-esteem. This finding was interpreted in terms of the hypothesis that children high in curiosity are those who have achieved 'competence' (White, 1959), through successful interaction with their environment, and have developed good self-concepts as a result. However, it is impossible to conclude from such correlational studies whether satisfactory adjustment is a by-product of successful cognitive activity, or on the other hand whether poor adjustment acts to inhibit such activity.

Parental attitudes. Maw and Maw (1965a; 1966) sent copies of the Parental Attitudes Research Instrument to the mothers and fathers of 200 children for whom curiosity ratings were available. The fathers of high-curiosity boys scored significantly lower than those of low-curiosity boys on the subscales 'Fostering dependency', 'Harsh punishment', 'Ascendency of husband' and 'Suppression of sexuality', and significantly higher on 'Equalitarianism'. Mothers of high-curiosity boys scored lower on 'Fostering dependency', 'Excluding outside influences' and 'Intrusiveness'. No significant differences were found between the parents of high-and low-curiosity girls. In summary, the authors conclude that the parents of high-curiosity boys are more likely to reward and encourage curiosity, to be more accepting of their children's behaviour, and to be more democratic in their rearing practices. It seems quite likely that these differences could be mediated by the superior adjustment shown by high-curiosity boys.

2.3.6 Evaluation and Conclusions (W.P. Robinson)

But why has the psychometric approach to curiosity failed? Why has no general factor appeared that would enable us to say that person A was more curious than person B? Is it because the measuring instruments are poor? Is it that the samples tested have been too homogeneous, with an absence of extremely curious and bored individuals (would someone that is bored fill in the questionnaires?)? Or is it that the underlying theoretical model is wrongheaded? While there are technical and methodological weaknesses in the investigations, it is to the last point that some attention may be most profitably given. Argyle and Little (1972) point to four basic models used in personality and social psychology. The first assumes individual differences which remain constant regardless of differences in situations (traitist), the second assumes differences between situations regardless of persons (situational), the third (dispositional) assumes the situations will affect the absolute performance of individuals, but not the relative differences between them. The fourth (interactional) assumes that relationships between performances of individuals will vary as functions of situation. The 'traitist' model has underlay work as curiosity; it has been expected that if person A is more curious than person B at ten o'clock on Friday morning about why there should be an enormous majority of female ducks on Dutch lakes, then he should be more curious than person B about all matters at all times and places. What evidence we have would suggest that the traitist model is most useful when the hereditary component of a characteristic is very heavy. We have no reason at present to think of curiosity in such a way, although there was no harm in wondering whether it could be applied.

If the ideas put forward in previous sections are valid, and factors such as ambiguity, novelty, surprisingness, complexity and incongruity are determinants of perceptual, and derivatively conceptual curiosity, then we must remember that these are *relational* and not categorical terms. What is novel to me may not be novel to you. If Berlyne's analysis is basically sound, then the most likely model for adult human beings is the interactional. There may be initial dispositional differences in responsiveness in infancy. Given the universality of many developmental problems and stages there will be situational differences. However, specialization will gradually increase as one gets older. We cannot all know equal amounts about everything and such a division of knowledge will lead to the interactional model being the most generally applicable. Any investigations of curiosity should bear this in mind.

This does not mean that we should abandon studies of individual differences, but that in investigating such differences we should be specific rather than general in our control of materials. We can continue to expect that some sets of persons will be chronically exposed to factors that will lead them to be comparatively ignorant or uncurious about certain topics, especially if we have some theoretical grounds for deriving these ideas. That we may have some is suggested in section 2.4.

2.4 Immediate Implications for Teaching

In view of the relationship that has been demonstrated between curiosity and learning performance, the possibility suggests itself of promoting and exploiting curiosity in order to enhance learning in the school. In this brief section, three broad types of approach to this problem are discussed; these are suggested by the three conceptions of curiosity – motivational, behavioural and organismic – which have been delineated above. They can be described briefly as follows: –

(1) Subject-matter can be taught in such a way as to arouse perceptual and conceptual conflict, and this can be utilised on an incentive for learning;

(2) Children can be trained in question-asking as a skill, so that their knowledge-seeking proficiency is increased;

(3) Measures can be taken to raise children's general curiosity-level, or they can be taught in a manner appropriate to their existing level.

Curiosity as an incentive. Educationalists have commonly supposed that children are naturally disposed to learn for its own sake, but that for some reason, this motivation is dissipated in the course of schooling. Such a view is expressed very forcibly by Holt (1964):

> 'To a very great degree, school is a place where children learn to be stupid . . . Children come to school curious; within a few years most of this curiosity is dead, or at least silent. Open a first or third grade to questions, and you will be deluged; fifth graders say nothing . . . Curiosity, questions, speculation – these are outside school, not inside.' (*p.* 156)

Responses of junior and secondary school children on Maas' 'Topics curiosity' test indicated that children's interests become more specifically channelled in the later school years, *i.e.* whereas young children tend to be curious about anything which is unfamiliar, older children tend to be interested only in a narrow range of subjects. Ausubel (1968, chap. 10) cites evidence from Jersild and Tasch (1949) suggesting that this decline in motivation stems from the emphasis placed in schools upon extrinsic incentives for learning, such as obtaining high marks and qualifications, anxiety-reduction and competition, as well as short-term rewards and punishments. The feasibility of this hypothesis is borne out by an experiment by Deci (1970), who found that students' interest in performing intrinsically interesting tasks, solving mechanical puzzles and writing headlines for college newspapers, fell off after they had been provided with monetary rewards for doing them. It is worth noting, by contrast, however, that Skinner (1969) recommends the systematic application of positive reinforcement schedules to promote classroom learning, and claims some success for the use of token rewards.

Ausuble proposes that 'academic motivation' subsumes three components, namely, 'cognitive drive', or the desire to know for the sake of knowing, 'ego-enhancement drive', or the desire to gain status and self-esteem through superior achievement, and 'affiliative drive', or the desire to gain approval from teachers. Berlyne (1960, chap. 11) makes a distinction between 'intrinsic' and 'extrinsic' epistemic curiosity: knowledge may be sought as an end in itself, or for the sake of some extraneous reward that it brings. 'Intrinsic epistemic curiosity' appears to be equivalent to 'cognitive drive', which Ausubel, while not denying a role to extrinsic incentives, suggests is 'potentially the most important kind of motivation in meaningful learning' (*p.* 367), since such learning provides its own reward (see sec. 2.6).

Although cognitive drive is seen mainly as a by-product of successful learning, Ausubel and Robinson (*op. cit.,* chap. 12) make some tentative suggestions as to how teachers might utilise discrepancies and apparent contradiction in curriculum content to generate conflict and thus arouse pupils' attention and interest. Berlyne (1965b) has also discussed the possibility of capitalising upon conceptual conflict in the classroom, particularly in relation to 'discovery learning', which he sees as consisting essentially of two phases in which motivating conflict is first induced, and then relieved by means of the response patterns that are to be learned. As an example, Berlyne cites Suchman's (1961) 'Inquiry Training' procedure. This starts with a short film demonstrating a novel or surprising physical phenomenon; for instance, a brass ball that is just small enough to slip through a ring sits on the ring after being heated. Pupils are then invited to ascertain the cause of the phenomenon by putting 'yes-no' questions to the teacher, and to formulate hypotheses and means of testing them. In a validation study, a group of children exposed to this method for a fifteen week period were significantly superior to a control group in the number of appropriate questions asked in a test situation. However, Ausubel (chap. 14) points out that Inquiry Training has not been shown to produce a superior grasp of the concepts involved, and he questions generally the supposed superiority of such 'guided discovery' methods over expository teaching in generating and exploiting intrinsic motivation (see also chap. 9 *ibid.*).

Relevance and curiosity. In general terms, the role of reinforcement, be it reward, punishment or conflict-reduction, is to make the learning of new responses or information worthwhile for the learner. It seems reasonable to assume that, even in the absence of direct external incentives, children will be most likely to want knowledge which is perceived as worth having, or somehow relevant to themselves. Among a sample of American college students surveyed by Young (1932), the reason most often mentioned for loss of interest in high school studies was the inability to see any need for the subjects studied.

Although the stimulation of such a need would appear potentially to have considerable incentive value, this area has received little experimental attention. The only study which has attempted to manipulate intrinsic relevance of course material is one by Hovey, Gruber and Terrell (1963), in which two university classes in educational psychology were subjected to two different teaching methods: one class was taught exclusively by lectures (three per week), while a 'self-directed study' (SDS) technique, involving small group discussion and only one lecture per week, was applied to the other. It was assumed that this latter condition was likely to enhance students' active involvement in course materials and thereby their attitudes towards them. A pencil-and-paper 'curiosity test' given ten months after the start of the course comprised three groups of five items, relating to 'question-raising behaviour', 'interest in educational psychology', and 'desire to get more information about educational psychology'. The SDS class was found to be slightly superior on all five items in the first group, and on four out of five items in each of the second and third groups. At the same time, the two classes did not differ significantly in their retention of course material. How far these results can be generalised is open to doubt, however, especially since they could easily be attributable to a 'Hawthorne effect', *i.e.*, the SDS group may merely have been responding to their awareness of participating in an experiment and receiving a 'special' treatment.

Training in question asking. Results reviewed in the previous section indicate that studies of questioning by pupils in the classroom is limited both in extent and depth, and Torrance (1970a), among others, has suggested that it tends to be discouraged by teachers. On the assumptions that asking appropriate questions facilitates learning and is itself a learnable skill, a number of attempts have been made to train children in questioning, independently of any assumptions as to what input variables might affect it.

One such attempt, cited by Fahey, was by Helseth (1926), who encouraged a small group of twelve and thirteen year olds to ask questions with a view to improving their thinking in American history classes. This group, it was reported, as a result asked more and better questions, participated more fully in class discussion, and exceeded norms on standardized tests. More recently, Pritchard (1970) encouraged questioning in social studies classes, and found that pupils who asked most tended to make the greatest gains in class position over the training period. This effect was more marked for less intelligent children.

Blank and Covington (1965) describe their training procedure more explicitly. Three groups of eleven year olds were presented with verbal descriptions of situations in which someone has to make a choice between alternative courses of action. An experimental group underwent an auto-instructional programme aimed at training them to tell when a question cannot be completely answered without additional information, and to seek the additional items by formulating suitable questions. A second group received an abbreviated form of the programme in which they were simply told that certain kinds of information were needed, while a control group received no programmed material at all. All subjects were given pre- and post-tests consisting of both oral and written problems. These showed a significant rise in the number of questions asked only for the experimental group, who also scored higher than the others on a science achievement test, and were rated by teachers as superior in class discussions about science. Similar procedures have been described by Scovel (1969) who succeeded in improving questioning performance, but does not report whether their subjects learned better as a result. It might be noted that Suchman's 'Inquiry training' did not appear to achieve this latter result.

It is also important to point out that the improvement in retention found by Blank and Covington and Helseth was non-specific, *i.e.,* there was no direct correlation between the content of the material that was learned and the questions that were asked. This may be contrasted with Finley's 'mud-puppy' experiment, in which the points that pupils recalled best were those about which they had asked questions. Again, any enhancement of performance following an intervention programme may be the result of Hawthorne effects rather than of the programme itself.

Measured curiosity and school achievement. Two studies by Maw and Maw appear to have possible educational relevance. The first of these (1962b) was concerned with reading comprehension: two samples of high-curiosity children were significantly better than their low-curiosity counterparts at spotting verbal absurdities which occurred among a series of twenty two sentences. In the second (1963), two high groups scored higher on a test of general knowledge consisting of items taken from children's encyclopaedias. In Weintraub's study, high-curiosity boys were judged by teachers to be higher in achievement and achievement motivation, and to have better study habits than low curiosity boys, while parents and teachers indicated that they preferred non-fiction books and read better.

The Maws have stressed the need for schools to attempt to enhance their pupils' curiosity level (1962b; 1970a), and to maximise teaching efficiency by taking curiosity level into account (1962a; 1970b). They have made no explicit suggestions, however, as to how these aims may be achieved. An opposing view is taken by Friedlander (1965), who argues that curiosity may operate only marginally as an incentive for classroom learning. As reasons for this assertion he suggests that: (1) curiosity is often unsystematic and non-cumulative; (2) it may be very immediately and easily satisfied; (3) it may be satisfied by partial or incomplete information; (4) it may not relate to the school curriculum; (5) individual differences in its content and amount would make it difficult to harness for teaching purposes. Ausubel (chap. 18) expresses similar doubts about the feasibility of attempting to exploit children's 'free-floating' curiosity in the classroom:

> 'Even if a general factor of cuiosity could be identified, it probably would have little psychological significance, since it is the level of curiosity in particular substantive areas that affects the productivity or creativity of an individual's work.' (*p.* 559)

2:5 Some Limitations of the Material Reviewed (W.P. Robinson)

The majority of the studies mentioned have involved experimental manipulations within the confines of the laboratory. This is a statement of limitation not an adverse criticism. Two small points may be speedily noted and passed over, a third and larger one will demand more attention. Within laboratories we like to have simplicity, and so the experiments have most often been concerned with subjects looking at diagrams of four-legged chicken rather than seeking to resolve the problems of man's place in the universe; the emphasis has been on the pared-down perceptual rather than on the complicated conceptual and confined to visual material within the perceptual domain. Additionally, attempts have been made to discount individual differences in previous experience by defining the value of factors intended to induce subjective uncertainty within the confines of the experiments, *e.g.* exposing a shape for thirty trials means it is less novel than one exposed for ten trials. The imposition of these constraints will tend to allow the cynical outsider to view the work as trivial and irrelevant. This would involve a mistake. Life may be more complicated outside than inside a laboratory, but the same laws and principles of behaviour apply; they are not suddenly suspended or reversed as soon as a subject walks into a room with the label 'lab' on it.

And when the conflicts are not happily resolved? In the light of the evidence presented we would have to concede that Berlyne's story about the operation of curiosity does correspond to what we currently know and is a better account than any other so far offered. However, there is another constraint of more serious relevance. Presumably when the subjects have been human, ethical considerations have dictated a bias towards attempts to arouse curiosity and satisfy it; this has been socially acceptable. But what about the induction of boredom and the punishment of behaviour associated with curiosity. These problems are treated but scantily and hence the picture presented is only one half of a portrait; we have learned somewhat about Dr. Jekyll, but where is Mr. Hyde? What happens when conflicts are not resolved by the generation or gift of an answer? Does the arousal dissipate or leak away until some other internal or external stimuli become strong enough to command attention and does the absence of the positive reinforcement of an answer decrease the organism's search-and-solve behaviours? This we do not know.

More important still it might be thought, would be the provision of external punishment both for wrong and right answers. That children or adults should be punished for resolving conflicts with right answers may at first sight seem strange, but consider the following questions:

> 'Are you being nasty to me just because you are in a bad mood?'
> 'What happens if I stick this pin into my baby brother?'
> 'Why is it all right for you to swear and not for me?'
> 'Why don't Archbishops give away all they have to the poor?'
> 'Would I really be arrested if I stole from Woolworth's?'

There is a whole range of questions about both the physical world and the social order where people might find answers that satisfied, but either the means of obtaining these or the answers themselves would evoke a punitive response. And in the long run we might expect punishments to have a decremental effect on the curiosity state and behaviour.

The second category would be conceptual conflicts in which the failure to resolve the conflict is directly punished. In some sense this must apply to all test item or questioning experiences which excite a subject's curiosity, but for which his inability to answer is met with disapproval of significant others or other forms of punishment. It is not clear just how repetitions of this sequence would affect the subject. One interpretation would suggest that *anxiety* would become conditioned to the behaviour state and all other contiguous variables (classrooms, teachers and school?), and move back in time so that even the possibility of questions being asked would serve to re-evoke it. Its evocation should diminish the chances of obtaining a satisfactory answer (see Eysenck, 1957) and its victim should become trapped in a vicious circle (technically a negative feedback loop!) of anxious incompetence. Another interpretation would be that the early stages of the story are the same as those just mentioned, but that defences against chronic anxiety will be brought into action. Without suggesting how such a situation might come about, we could conceive of the child developing armour plating for such situations, a shield preventing the full operation of the distressing stimuli, behind which he can be relaxed and unresponsive.

Regardless of whether each, both or some other explanations are appropriate for the interpretation of failures at conflict resolutions and punishments for either success or failure, it is clear that more attention needs to be paid to this side of affairs. Holt (1964) has argued that children become 'bored' because we encourage them to act stupidly (*p.* 169):

> 'We adults destroy most of the intellectual and creative capacity of children by the things we do to them or make them do. We destroy this capacity above all by making them afraid, afraid of not doing what other people want, of not pleasing, of making mistakes, of failing, of being *wrong*.'
> (*op. cit.*, *p.* 167)

That we cannot state with supportive evidence what the long term effects of these experiences are may mean that the word 'boredom' is currently used to cover diverse moods. For Berlyne 'boredom' results from an abnormally low and/or monotonous pattern of highly predictable external stimulation which allows a state of high internal arousal to develop. This excites the organism into 'diversive exploration' thereby decreasing the level of arousal. The idea that absence of variety in external stimulation allows the organism to drift into a state of high rather than low arousal is supported by evidence of restlessness, agitation and emotional upset rather than drowsiness or sleep as being more commonly mentioned symptoms of this 'boredom'. However, we also refer to such a sequence of events by saying that 'He fell asleep because he was bored'. Ought we to refer to both these states by the same term? The confusion seems to have arisen because of the emphasis upon the similarity of the conducive stimuli rather than on differences in responses by the person. Let us compare three situations all involving monotonous stimulation. In the first situation, the becoming bored person gets out of the situation to do something interesting, in the second situation he rejects this possibility and passively and happily accepts the sleep induced. In the third there is a conflict; he is not allowed to leave the situation, he is not permitted to fall asleep. What is he to do? He can struggle to keep awake, he can engage in diversionary activities. He will be restless, agitated and emotionally upset. If this analysis makes sense, then the indiscriminate application of 'boredom' to each variant may be understandable, but it is also confusing: it allows 'He fell asleep because he was bored', 'He was getting bored, so he leapt up to take the dog for a walk', 'He started throwing paper darts because he was bored'. On Holt's argument it is the 'boredom' of conflict that pervades the classroom.

We have then to include in our work a consideration of intrinsic motivation for finding out that fails to obtain the critical knowledge and ask about the chronic effects of such experiences. We have also introduced extrinsic sources of motivation into the discussion by pointing out that the environment can, through its responses to children's actions, reward and punish curiosity and its expression. To make some assessment of how these factors interact we shall have to widen the scope of our enquiry to set 'intrinsic motivation' in a more general analysis of child development.

But before this can be done it may be useful to consider briefly the relationship between curiosity and questions. The issues are posed in three figures (Fig. 2.1, 2.2 and Table 2.1). Figure 2.1 is intended to provide a summary of Berlyne's analysis of curiosity and questions. While we would claim that Figure 2.2 and Table 2.1 are an improvement on Berlyne's contribution, it is right to stress that they could not have been produced without Berlyne's theoretical and empirical contribution as the foundation, and we would hope that they are seen as attempts to complete rather than reorganise.

The omissions in Berlyne's picture are highlighted in the figure. No connections between perceptual and conceptual conflict are given, nor connections between either of these and boredom. We have already mentioned the omission of comments about unresolved conflicts. Although questions are cited as inducers of conceptual conflict (Berlyne, 1960, *p.* 289) no other factors are cited as playing the same role, and there is no attempt at distinguishing either between questions as determinants and questions as symptoms of curiosity or between questions which are related to curiosity and those which are not. Several of these points may be seen as not a typical of models based on S-R analyses: somehow the environment generates stimuli to which the organism responds, while responses are left hanging in the air.

Figure 2.2 attempts to make good these omissions. All actions of the persons are drawn as feeding back stimuli to the organism for reanalysis, while the 'Outside Events' and 'Intervention by Other People' are employed to show that the person is not purely an agent and self-organizing system, but is object and victim as well. We have included events such as rumbling tummies, parched throats and rampant adrenaline as forms of internally generated distracting stimuli, while allowing outside intervention a similar role. The assimilable – understanding – coping action sequence handles the non-problematic, the eventual consequences of resolving conceptual conflicts, and stimuli that might be thrown up during diversive exploration. We have abandoned the distinction between perceptual and conceptual conflict. Berlyne was right to emphasise the perceptual sequence for two reasons. In the first place much of his validating experimentation has relied on visually presented materials so that variations in the collative properties of stimuli could be clearly controlled and measured. Secondly, it may well be misleading to describe the activities of infants as involving 'conceptual conflict'. However, with more mature subjects, we might prefer to say that perceptual conflict can only arise out of conceptual conflicts. Pictures of four-legged chicken evoke attention because the concepts of chicken and four-leggedness do not have an immediately assimilable intersect. We escape the issue by using 'uncertainty' as a substitute for all conflicts. Although we have not read what, if anything, philosophers have to say about 'curiosity', we suspect that everyday usage would enter it as a class of 'uncertainty' – not all uncertainty is a sign of curiosity, but all curiosity implies uncertainty. It may be the case that where uncertainty is induced by the environment and where decisions and actions are required by the environment and other persons, 'curiosity' is not the normal word to use. Is it only when one is not under duress to find out, but nevertheless wants to do so that 'curiosity' is the appropriate word to use? This would mean that a state of uncertainty is only one of 'curiosity' when the person actively wants to eliminate uncertainty because he wants to. This does not imply that it is a residual category to be employed solely when no other reasons for wanting to find out can be discovered. Quite the reverse perhaps! We will want to find out except when other forces act to prevent us. Such a position would be consistent with the cognitive developmental approach. While such an analysis is a caricature of what is really required, it suffices to locate curiosity as a class of uncertainty.

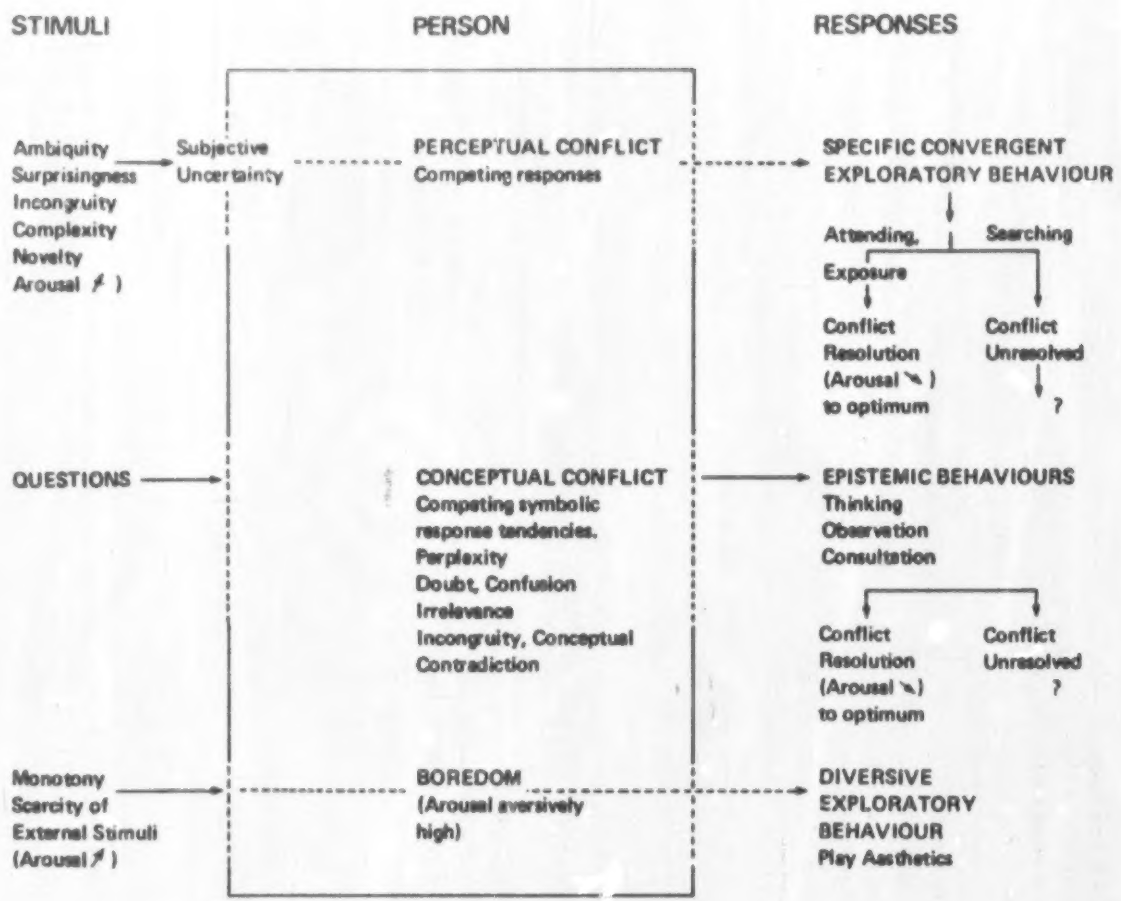
The epistemic behaviours are Berlyne's. Reasoning appears half in the person and half out because, although we are able to devise situations in which we can observe the products of thinking, we do not always do so and might not be able to do in the face of an uncooperative, unwilling, or incapable thinker. 'Observation' is intended to range from Berlyne's simple inspection through to the elaborate experimentation of professional scientists.

Overt posing of questions can occur in any of the types of epistemic behaviour. Questions can be covertly posed in Reasoning and Observation. We must therefore realise that in any situation where we observe questions, those overtly elicited may only be a sub-set of the questions that the person in fact has. We must also distinguish between questions the person asks because he is curious and those which are posed to him. In Chapter 9 Prosser elaborates this distinction, and is particularly concerned to isolate the differential consequences for learning of questions provided by other persons and questions generated by the subject himself.

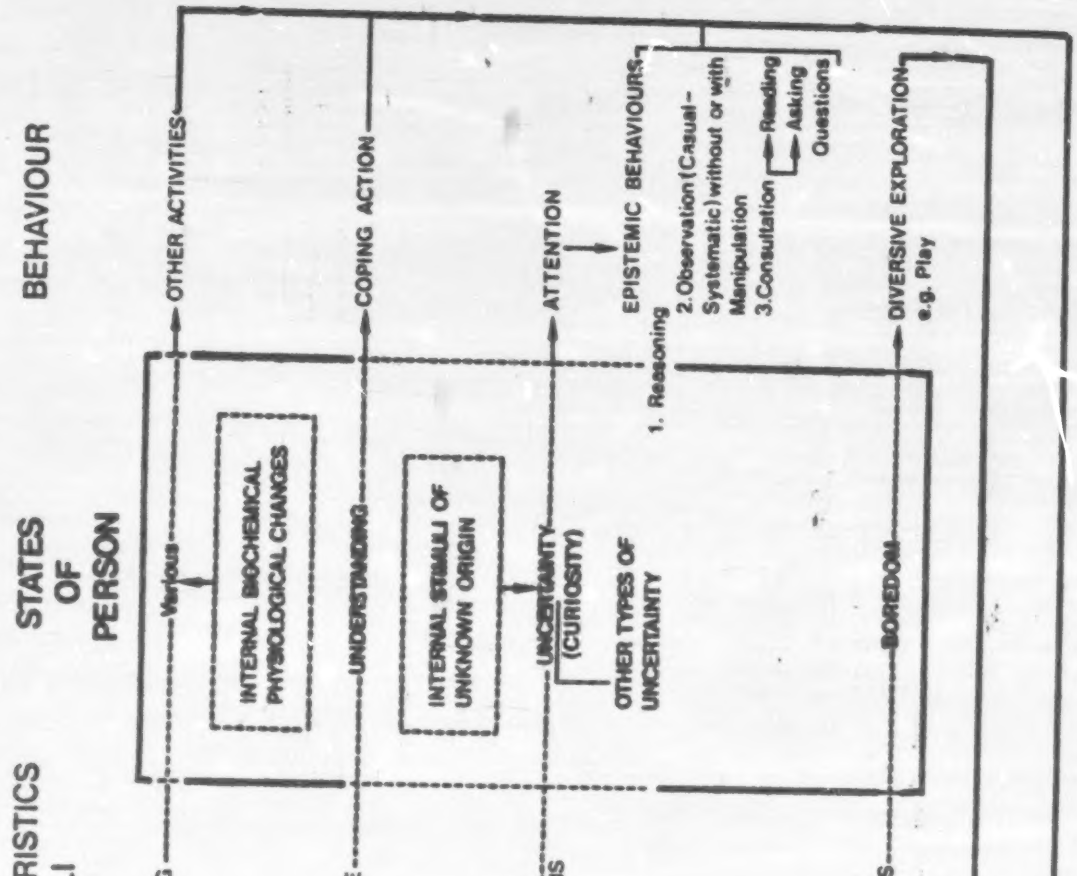
On this analysis, the expression of a question is not a necessary consequence of his being curious. Questions are but one possible symptom of curiosity and one means of attempting to satisfy it.

The list of the functions and determinants of questions in Table 2.1 may be unsophisticated, but is suffices to make the point that the occurrence of a question does not enable us to infer that a state of curiosity exists. Questions and curiosity are related to each other neither as necessary nor sufficient conditions of each other. The strongest statements that can be made are that some questions are indicative of a state of curiosity

Figure 2.1


STIMULI
PERSON
RESPONSES
Ambiquity
Surprisingness
Incongruity
Complexity
Novelty
Arousal ↗)
Subjective
Uncertainty
PERCEPTUAL CONFLICT
Competing responses
SPECIFIC CONVERGENT
EXPLORATORY BEHAVIOUR
Attending,
Searching
Exposure
Conflict
Resolution
(Arousal ↘)
to optimum
Conflict
Unresolved
?
QUESTIONS
CONCEPTUAL CONFLICT
Competing symbolic
response tendencies.
Perplexity
Doubt, Confusion
Irrelevance
Incongruity, Conceptual
Contradiction
EPISTEMIC BEHAVIOURS
Thinking
Observation
Consultation
Conflict
Resolution
(Arousal ↘)
to optimum
Conflict
Unresolved
?
Monotony
Scarcity of
External Stimuli
(Arousal ↗)
BOREDOM
(Arousal aversively
high)
DIVERSIVE
EXPLORATORY
BEHAVIOUR
Play Aesthetics

Representation of Berlyne's Analysis of Curiosity, Boredom and Questions.


CHARACTERISTICS OF STIMULI
STATES OF PERSON
BEHAVIOUR
DISTRACTING
Various
OTHER ACTIVITIES
INTERNAL BIOCHEMICAL PHYSIOLOGICAL CHANGES
ASSIMILABLE
UNDERSTANDING
COPING ACTION
INTERNAL STIMULI OF UNKNOWN ORIGIN
AMBIGUOUS
SURPRISING
INCONGRUOUS
COMPLEX
NOVEL
UNCERTAINTY
(CURIOSITY)
OTHER TYPES OF UNCERTAINTY
ATTENTION
EPISTEMIC BEHAVIOURS
1. Reasoning
2. Observation (Casual-Systematic) without or with Manipulation
3. Consultation
Reading
Asking Questions
MONOTONOUS
ABSENT
BOREDOM
DIVERSIVE EXPLORATION
e.g. Play
OUTSIDE EVENTS OR INTERVENTION BY OTHER PEOPLE

An Elaboration of Berlyne's Analysis of Curiosity, Boredom and Questions.

Figure 2.2

Table 2.1 Functions of Questions*

OCCASION OF OCCURRENCE	FUNCTION OF QUESTION	EXAMPLE
Discomfort: present or threatened (Request from other to ask questions)	1. Escape from or avoidance of discomfort	Why don't we talk about something more cheerful? (Any that look all right)
	2. Conformity to norms	
Part of formalized procedure (see appropriate book of rules) for (a).	(a) Institutionalized	How does the prisoner plead?
Politeness, consideration, *etc.* (Request from other to ask questions)	(b) Subinstitutional	Did you have a good day at the office? (Any that look all right)
Artist's judgement of appropriateness	3. Aesthetic	And when shall we three meet again?
Attracting other's attention. Transfer from speaker to listener role. Keep conversation going.	4. Encounter Regulation	What's the hurry? What do you think?
Questions used as part of formalised procedure	5. Performatives	How does the prisoner plead?
	6. Regulation of self	
Focus of attention on object of ignorance.	(a) behaviour	Where's my handbag?
Dissatisfaction with mood.	(b) affect	Why don't I pull myself together?

	OCCASION OF OCCURRENCE	FUNCTION OF QUESTION	EXAMPLE
	Wish to change other's behaviour (wish to focus attention).	7. Regulation of others (a) behaviour	Why don't you push off? (Now what have we here?)
	Wish to change other's mood (attempt to arouse curiosity in other)	(b) affect	Why don't you cheer up? (Now what can this be?)
	Attempt at catharsis	8. Expression of affect	Why am I so silly?
	No special relation to questions	9. Marking of emitter (a) state (b) personality (c) identity	–
	Show who is playing which role e.g. Interviewer, Queen, Doctor, *etc.*	10. Role relationship marking	As context requires or allows
CURIOSITY	(Occurrence of gap in knowledge which person requires to be filled)	11. Representational + 13. Inquiry	(Any where replacement of interrogative word or reordering of syntax results in a statement whose truth value can be checked)
	(Wish to check knowledge of other)	12. Instruction	(What is a question?)
	Occurrence of gap in knowledge about language systems and their workings	14. Meta-language	What is a question?

* These functions are based as an identical list of functions of language in general (Robinson, 1972). + In the original list of questions about representational problems were accorded a separate function. ( ) is used to mark types of questions of particular relevance to the project.

and that a state of curiosity sometimes results in questions being asked. We might choose to face matters and assert that curiosity is a sifficient condition for the posing of questions and add that, unfortunately, such posed questions are not necessarily given over expression. We might wish to insist that the baby staring longer at a complex geometrical shape than at a simple one was implicitly asking himself 'What's that?' for longer. But why should we bother to do so? Distortions of ordinary usage are justified only if some reasons can be given for the desirability of making the change, and in this case such justification is hard to imagine.

This looseness of the linkage does not mean that many questions might not be speedily eliminated as possible symptoms of curiosity. For example, we can examine form and content as well as context as possible bases of discrimination. Pragmatically, the major difficulty seems to be in distinguishing between sincere and simulated questions. The experimenter holds up materials and asks the children what they would like to know. The questions flow. Because the children's curiosity has been aroused? Or, as we shall suggest in chapters 6 and 7, because children oblige? If the children remain silent or do not write, something unpleasant might happen. It is not difficult to think up a few questions for these crazy people. And sheer habit may be enough. In so far as children do what they are told to do, conforming to norms, they will write or ask questions. They may ask, 'Why don't you push off?', but for the easy life it is simpler to produce questions that look like the sort of questions one might genuinely have. Certainly there are ways of probing that would help to distinguish between the sincere and the simulated, and there are ways of priming situations so that only genuine questions are likely to occur.

Forgetting the complication that Figure 2.2. allows simulated questions to become genuine questions once they are produced, we may be able to say that all but two non-curiosity types of questions could be readily diagnosed from context, form and content. Likewise, some avoidance of other activities and norm conformity questions could be eliminated. We suggest that ways of discouraging and distinguishing insincere questions can be devised, but that these require a subtlety of priming and probing that are not readily available to experimenters in classrooms.

2.6 Curiosity and Boredom in the Context of General Intellectual Development (W.P. Robinson)

It is fitting that the last four sections should have been permeated with both the theoretical and empirical contributions of Berlyne. While he has persistently pointed to the power of intrinsic motivation as a mainspring for the acquisition of knowledge and he has argued for the value of perceptual and conceptual conflict as the source of learning new structures of thinking, he has consistently expressed his ideas in the S-R terminology preferred by neo-behaviourists (Berlyne, 1960; 1965). His work has been eclectic in the better sense of that word.

What follows is consistent with Berlyne's implicit preference for looking at all the facts rather than selected samples. The basic premiss is that optimally efficient teaching cannot be based on false theories about the characteristics of the learner. Everyone can see that it is stupid to feed hay to a car to nourish it or to shout instructions at it in order to make it move. To control or instruct a piece of machinery successfully, you rely upon rule-of-thumb techniques justified by previous empirical success or upon some accurate knowledge of how the system works. The structural and functional characteristics of the machine define and delimit what is possible. And so it must be with children. The limitations of their capacities and dispositions define their possibilities. It is of no avail to have explicit educational objectives, a clear specification of possible means of achieving these along with an impressive array of material and human resources, if the means do not fit in with the characteristics of the learner.

What are these characteristics? The crudest dichotomy currently available is between the 'empty black box' and the 'fully programmed versions' of human nature. A caricature of these views might contrast the following emphases. The 'empty black box' view stresses the significance of experience for shaping behaviour, *i.e.* extrinsic motivation. The patterns of rewards and punishments will control the responses and habits children develop. Primary rewards and punishments refer to activities and events associated with reductions in biologically based drive states. On the one hand, animals will learn responses associated with reductions in hunger; on the other, they will learn how to escape, and later avoid, pain. As Skinner has neatly phrased the idea, 'The best reason for learning is the consequence of not doing so'. To the extent that such ideas are valid we are products of our environmental pasts.

The 'fully pre-programmed' view will assert the importance of innate factors as determinants of behaviour — what we become is hardly dependent upon the environment at all. While extreme rationalism has not influenced the educational system, the 'cognitive developmental' approach has. This stresses the importance of the interaction of organism and environment, but suggests that almost any 'normal' environment will serve to allow intellectual development. The organism actively explores and processes its environment, constructing rules of procedure that facilitate adaptation. Development occurs when conflicts arising between rules are resolved with some new, more adaptive, rule of action. If we adopt an extreme commitment to these beliefs our education will consist of making sure that environments suffice to allow children to develop without indue hindrance; if we follow the 'empty black box', it has to be a highly structured programme with appropriate deployment of sanctions. The cognitive developmental approaches emphasise intrinsic motivational factors, the 'empty black box' extrinsic ones.

But are these views contradictory? Or is it merely that they are both valid approaches focusing upon different aspects of the developmental process. We will argue that the main deficiency of each view is made good by the articulation of it with the other.

It is easier and more appropriate to begin with the cognitive developmental approach and articulate the reinforcement view with it rather than the other way round.

Piaget is notoriously difficult to expound with clarity and simplicity, as even Piaget himself appears to find (Piaget and Inhelder, 1969). (Because we are not or he is not conceptually sophisticated enough to understand it? Because our language is short of appropriate technical terms, and we have not had sufficient practice in using those available?) At least the essence of his system can be given in brief.

The human organism has problems of adaptation to its environment, and it is designed in such a way that it will continue to expand and elaborate its *knowledge* of this environment. The well-fed and watered human being is not quiescent. His brain begins to fall apart if either excessively over- or under-stimulated through the various sensory modalities; however, there are optimal qualities of stimulation that lead to learning as well as confirmatory behaviours of various sorts. Piaget discusses some of the problems of modes of adaptation by invoking concepts of processes (*e.g.* assimilation and accommodation) and structure (*e.g.* schema and environment). Schema refers to something in the brain of the organism and is somewhat like a plan of action or a set of rules for processing and acting upon a certain stimulus input. It is an internal representation by means of which the organism is able to act in its environment. When a stimulus input corresponds sufficiently closely to an already available set of schemas, assimilation occurs, the new experience being integrated into the appropriate sets of rules which themselves remain unchanged. Alternatively no set of rules may be adequate for the problem in hand or different sets of rules with mutually incompatible outcomes are simultaneously engaged, in which case there are possibilities of accommodation. The organism may simply fail to adapt to the input, but if it succeeds by changing one or more of its rules of action, accommodation is said to occur. Accommodation involves a structural change in the rules, assimilation will extend only the domain of coverage of a particular rule.

Schemas can, according to Bruner(1966), represent knowledge in three possible ways: enactive, ikonic, symbolic. Enactive schemas are action-based. Knowledge is manifested by performance. Most of us will have a complex set of schemas that enable us to ride a bicycle, but this 'know-how' is not available for effective expression in any detailed symbolic form. Developmentally, the child's first knowledge is in the form of enactive schemas only, but later some of these are reorganised at an ikonic and yet later still at a symbolic level. Other later knowledge can be acquired directly at ikonic or symbolic levels. Piaget argues for an invariant sequence in the development of major changes in the structure of the child's thinking and behaviour. To date the empirical evidence is fundamentally supportive of the heuristic value of tha cognitive developmental approach, and even if much of the theoretical terminology were to be abandoned, the accumulated facts would remain to be explained.

Piaget's approach has a number of important features to which attention may be paid. In line with other more recent work it argues for a cognitive basis to motivation. A lack of novelty or challenge in the environment promotes action, action gives rise to discrepancies among schemas or between schemas and reality as tested, accommodation is required. This picture of an active knowledge-seeking explorer does not have to invoke a biological basis for learning in terms of primary and secondary drives, discrepancies alone suffice to motivate. Knowledge accumulates at all levels of representation, becomes organized and systematized and re-organized, corresponding more closely to a valid construction of the world. The levels themselves differ in potential generality, abstractness and power for solving new problems.

But we may legitimately ask, 'Whatever happened to Piagetian man?' Where did all the enthusiasm and power of intellect go – long time ago? How much sound knowledge has accumulated? Are adolescent children really functioning at the level of formal operations, having developed a true mastery of a conceptual system that can be used to represent all manner of abstract and hypothetical contingencies?. Are we?

Any why not? How does it come about that most of us experience so few, fleeting and fragile realistic interactions with the world?,

We would argue that Piaget's model of development is primarily a model of competence rather than performance; he has been interested in what children and adults can manage under optimal conditions with simplified materials. To this extent, he presents an ideal to which the conceptual system of man may aspire rather than a summary of how particular sub-groups of humanity perform in their everyday surroundings. (And his ideal is tarnished to the extent that Genevan schoolchildren fall short of the eventual possibilities of mankind). Further he has been interested in the development of the fundamental operations of thinking as a process. He has not been interested in the mass of information we acquire, only how we can use it. He has not been interested in the 20,000 words in vocabularies, each with many meanings, but only with general understanding of the system.

If we are interested in performance as well as possibility and in what goes on as a matter of natural history, we may note some assumptions in the Piagetian account that may not then be warranted.

Firstly, he plays down the relevance of the environment. It is assumed that what is made available for children to learn is, by and large, adequate in quantity and quality for development to occur. Secondly he implies that unlimited generalisation of operations and their applications will eventually occur: that the principles underlying thinking in mathematics will generalise to social behaviour, for example. Thirdly, he plays down the role of language in development. Fourthly, he ignores the fact that we are often required to act quickly with insufficient time for a complete analysis of the information relevant for the decision to act. Fifthly, he ignores the relevance of sanctions to behaviour; generally he ignores rewards and punishments, specifically he ignores the consequences of failures at accommodation.

That sanctions can be used to control behaviour has been known for a long time. Precisely what constitutes a reward or punishment and the details of their relationship to learning remain a little mysterious, but their efficacy is a fact. That reinforcement in traditional terms may be neither a sufficient nor a necessary condition for learning to occur is irrelevant. Unfortunately, experts on reinforcement principles are liable to present their arguments and evidence in misleading ways, and those not claiming to be experts are liable to reject versions of reinforcement theory which they have already simplified and distorted. As Skinner has repeatedly demonstrated, the precise timing and location of appropriate rewards and punishments are relevant to the building up of compound and complex response patterns — behaviour can be shaped. That Skinner may have overgeneralized his position to incorporate features of behaviour to which reinforcement contingencies may be immaterial — one popular contender being the development of grammatical competence — does not detract from the facts that food for hungry, but not too hungry, rats not only appears to speed up rates of acquiring sets of responses, but also to be critical for their performance. As with Piaget, so with Skinner. He sets up an ideal — in this case a theoretical framework about 'schedules of reinforcement' and then examines how far such a system can take the inquiries. It is irrelevant whether Skinner genuinely views the human organism as an empty 'black box' with a finite number of biologically based needs whose reduction is linked in some way to learning. The question is how far can such a model take us.

Currently it would appear to have limitations, particularly in relation to the development of thinking. The fundamental principles of thinking do change as children develop, logically new operations become possible. The role of reinforcement in these developments is unknown, but it appears not to be sufficient on its own and may be wholly irrelevant. But of its relevance to behaviour in performance there is no doubt! The quantity, quality, timing and frequency of rewards and punishments shape behaviour. Are schedules of reinforcement relevant to the non-appearance of Piagetian man? If for the sake of argument we allow Piaget to be fundamentally right about the sequence and levels of development, can schedules of reinforcement accelerate, slow down or even prevent 'normal' development?

2.7 Intrinsic and Extrinsic Motivation (W.P. Robinson)

2.7.1 School Achievement, Social Class and Use of Language

How these two sets of facts and ideas may be articulated and shown to be complementary rather than mutually incompatible is most easily clarified through an extensive illustration. 'Social class' comes to occupy a dominating position in our work and it is therefore a topic about which it is apposite to achieve such a synthesis. We shall not concern ourselves with the definition of social class and will mention only briefly the substantial documentation of social differences in educational attainment. We can then enter into a short interpretation of class differences in language mastery that may be causally associated with differential achievement. It is only after these issues have been set out that the framework generated will enable us to return to a consideration of the development of intrinsic and extrinsic motivation and how these may differ by social class.

Reports across countries (Husen, 1972) and within Britain (see, for example, Douglas, 1967; Douglas, Ross and Simpson, 1968; Davie, Butler and Goldstein, 1972; Morton-Williams and Finch, 1968) record with persevering unanimity the underachievement of working class relative to middle class children. The differences remain, regardless of the index of attainment used and regardless of whether or not one controls for variation thought by some to be heavily influenced by genetic factors, *viz.* intelligence test scores. We need not concern ourselves too precisely with what we mean by 'social class'. (Some critics specialise in first treating class as a unitary dimension, then exposing that it is not, and then denying its value as a concept. What is the social class of a man who left school at fourteen, working his way through to becoming a director of a large industrial combine, who, after receiving his honorary degree from Leeds, takes up bricklaying?) There is a substantial minority of people whose incomes, prestige status of occupation, educational history, standard and location of housing, diverge sufficiently to preclude unequivocal placement in a class category. There are many 'borderline' jobs. However, there are also rough nodes about which people cluster and the labels of lower and upper working class, lower, middle and upper middle class and upper class* are useful reference points for capturing substantial proportions of variation between people in our society across many aspects of behaviour.

In the search for sources of working class underachievement in the educational system, Bernstein pointed to the possibility of a differential use and command of language. This does not deny the possible importance of many other factors, it only serves to specify one such factor. In a succession of papers (see Bernstein, 1972 for an almost complete collection), he has developed ideas of 'restricted' and 'elaborated' codes of language use. While early writing stressed that the 'restricted' code was relatively more predictable at both syntactic and lexical levels of linguistic analysis and that it inhibited the symbolization of intent, later writing has emphasised that the code generates particularistic meanings that are severely context bound. As Lawton (1968) has pointed out 'restricted' has been variously used to refer to a limitation on the number and type of linguistic units and structures that can be deployed, a limitation on the number of people who share the code, and a 'restriction of the range of social contexts from which issue appropriate linguistic structures' (Lawton, 1968, *p.* 99). It has been proposed that while the middle class has access to both codes, the lower working class is generally confined to a 'restricted' code, and in the papers referred to by Bernstein elaborates relationships between codes, social structure and education.

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*These adjectives are used so frequently that they are henceforth abbreviated: LWC, UWC(WC); LMC, MMC, UMC, (MC); UC.

Here the issues will be simplified, and we will follow the recommendation that a functional/structural approach be adopted for the study of the relationships between language use and social differences in behaviour (Robinson, 1972a)! Of the many functions of language we will concentrate upon aspects of two: language is used for the social functions of *controlling the states and behaviours of other people* and for the *representation of knowledge.* We can issue and receive orders and threats which may or may not be carried out. By such verbal means, non-verbal and verbal behaviour can be regulated. As well as using language as a direct means of changing present behaviour, we can use it to mark the state of a role relationship or define role appropriate behaviour. In the forms of address we use we signal who has more power in a relationship or that we are equal, and if we are equal, whether the relationship is cohesive and interdependent or not. The recognized right to issue orders is a mark of a power differential, while the use of assertions like 'I love you' can mark the existence of a cohesive relationship. We can also make verbally explicit what behaviour is expected of another person. Written contracts may specify such rights and obligations and can give them legal force, but social norms transmitted orally and apparently casually can have as much effective power.

It will be argued subsequently that LWC mothers (and other transmitters of the class culture) emphasise these uses of language in their socialization practices at the expense of the development of the representational function of language.

We use the units and structures of language to form sentences which can be used to make statements. These statements can be evaluated in terms of truth or falsity. Do they correspond to some reasonable construction of reality, more commonly if less accurately referred to as, the facts of the matter? The truth-value of statements is constrained by what the world is like and so can be tested in ways in which 'Good Morning, Sir!, 'Hurry Up!' or 'Little boys don't pick their noses!' cannot. For the last, the smiling son who announces to his mother that her statement is false, because he does pick his nose, is likely to discover that she was not putting forward an hypothesis. It is through the representational function that we can communicate about events and ideas remote from present perceptions by virtue of time, space, generality or abstraction. That whole accumulation of our cultural wisdom and knowledge stored in writings about geography, history, chemistry, engineering, sociology, education, law, in fact is all empirical knowledge, both about the natural and the supernatural, and all knowledge of logics relies on the representational function of language. And it is not just 'knowing that' which is thus represented, but also 'knowing how'; it not only the transmission of such knowledge from person to person that is involved, but the storage, analysis, processing, and synthesis of one's personal ration. While we may pause to remind ourselves of Bruner's suggestion (1966) that knowledge represented in symbolic form is only one form, and that enactive and ikonic representation are also involved in human existence, we must concede that a high proportion of the knowledge transmitted in the educational process is (and has to be?) in verbal form. All such knowledge then requires not only an exercise of the representational function of language, but a mastery of the units and structures *in appropriate correspondence* to the non-verbal world. In the systemization of knowledge and the generation of theory, general and abstract descriptions and explanations are constructed from the particular and concrete observations. This information is transferred from one person or source to another by employing units and structures that are not so implicit in their reference as to allow a vagueness and ambiguity that renders the messages useless. How far any failure to develop such facilities with language affects other intellectual development will not be argued here, but it is evident that the accumulation of knowledge in many school subjects can be adversely affected by deficiencies in the command of this function of language.

Members of the lower working class, it is suggested, suffer from such a deficiency, and the evidence available from a number of investigations is generally consistent with this point of view (Lawton, 1968; Robinson, 1972a *pp.* 148-185). Adverse criticisms have been made (see Williams, 1970) which sometimes refer to the MC norms that may have governed the contexts of speech collection (Williams and Naremore, 1969) and at other times to the fundamental linguistic competence of 'disadvantaged' groups (*e.g.* Labov, 1970). The study which has so far produced the best summary description of the differences between MC and WC speech was methodologically weak (Schatzman and Strauss, 1955), but the analogy employed merits repetition. To sum up the characteristics of WC speech of eyewitnesses asked to report about a tornado, Schatzman and Strauss say that it would seem that the WC witnesses have acted like film cameras. What they have seen has been largely determined by passive attention determined by changes in the strength of stimuli in the immediate environment. When asked about the tornado, it is as though they play the film back and commentate upon it to the interviewer, at the same time assuming that he can see the film. The account is therefore particular and concrete, references are not made explicit, there are no concessions to the listener's possible difficulties of understanding, and the film has not been edited to 'make sense'. By contrast, the MC interviewees have been trying to make sense of events while they have been watching, actively organizing their material to gain as objective, general and abstract an account as possible, as well as recording specifics. This means that at a later point in time they have a variety of perspectives from which the story can be narrated and a number of levels of abstraction at which it can be pitched. Reference is explicit and attempts are made to link the story to the interviewers categories of experience. This understanding of and ability to exploit the power of the representational function of language is what is supposed to characterise MC speech and writing. There has never been any evidence to suggest that the middle class are at all incompetent in the social functions of language.

If we turn to data about socialization practices, we can begin to see how such social class differences might come about and how these would relate to intrinsic and extrinsic motivation.

2.7.2 Social Class and Patterns of Control and Communication in Socialization

The data focus upon discipline problems and question-answer exchanges which we may treat as contrastive in that the former appears to encourage the mother towards 'control' of behaviour while the latter has a pressure towards the 'communication' of knowledge.

Here we concentrate on corrective and preventive rather than constructive aspects of control. Bernstein has distinguished three categories of control by which mothers can reprimand children, get them to bed or school and handle the multitudinous other problems they encounter. *Imperative techniques* are of two kinds: brief verbal commands such as 'Go!' or 'Shut up!' and non-verbal techniques such as smacks and bodily removals. Threats were included under 'brief commands'. *Positional appeals* refer the child to the proper behaviour expected of members of some status group of which he is a member; 'Boys of your age go to bed at seven sharp' gives the child a prescription based on sex and age, but familial, relational and other reference groupings would also be positional. *Personal appeals* make reference to behavioural and/or emotional consequences for specified individuals: 'If you do not go to bed now, you will be bad-tempered and tired tomorrow and then . . .'. In this case the attempt to control behaviour is mediated by an appeal to a fact and its relevance to some particular person.

What differences are there between these strategies in terms of what is available for the child to learn and how is language relevant to the information transmitted? The non-verbal imperative treats the child much as a rat is treated in a Skinner box; he is left to work out the rules by which rewards and punishments are distributed. The imperative command also leaves the child to work out the rules of the game, but language is used to exert direct control of behaviour. Threats make explicit connections between acts and consequences. Each is an example of what psychologists would refer to as classical or instrumental conditioning paradigms. Positional appeals utilise language to make the rules explicit and from them the child may be able to infer a set of same-level rules defining behaviour appropriate to given ascribed roles. None of these three are likely to be amenable to questions that could be construed as anything but challenges to authority.

Personal appeals, on the other hand, differ in several respects. Firstly, they are likely to give the child some facts about the physical or social world, little lessons in social psychology or natural science. Secondly, as a matter of fact, they are likely to invoke general principles such as not upsetting other people rather than situationally specific proscriptions. Hence, they can serve as useful principles for decisions in new situations, they have deductive possibilities. Thirdly, they can be questioned. It is possible to query the relationship between the premisses and the conclusions without challenging authority.

If we ask whether there are social class differences in who uses which sort of strategy how often, Bernstein's data on five year old children give clear answers. While MC and LWC mothers did not differ in their use of positional appeals, LWC mothers were more likely than MC mothers to use the imperative strategies, while the reverse was true for child-centred personal appeals. Similar results are reported for American mothers by Hess and Shipman (1967).

A simplification of these data would allow the following inferences. LWC children are more likely to be disciplined without language being employed. If it is used, it is to exert direct control over behaviour or to assert what is role appropriate behaviour in relatively specific situations. Questions are not likely to be encouraged. By contrast the MC mothers, although using direct means of control and positional appeals, are also using language to transmit moral principles of more general utility and to give the child some facts about the physical and social world, while leaving open the possibilities of 'why' and other questions occurring.

We have looked directly at these questions of children: mothers reported how they would answer a number of 'why' questions supposedly asked by their five year old children (Robinson and Rackstraw, 1972; Robinson, 1972b). LWC mothers were less likely to answer questions at all, gave less and less accurate information in a 'noisier' linguistic context. They were apparently less concerned about the relationship between what they said and the non-verbal world this was intended to represent. They pointed out fewer similarities and differences among objects and events. In answer to 'why' questions, they were more likely simply to repeat a question as a statement, *e.g.* 'Because they do' or make a simple appeal to regularity, *e.g.* 'Because they always have done'. The MC mothers were more likely to mention causes, consequences, categorisations and analogies. Hence, in this situation where the opportunity for transmitting knowledge about the non-linguistic world depends upon an optimal use of the representational function of language, the MC mothers exploited this by providing the children with answers representing the world as a system of objects and events related and organised in space and time. The LWC mothers, however, appeared to be containing rather than answering questions and with 'why' questions subsequent enquiries by the child could be a challenge to the mother's authority and the cultural tradition in which it is vested; the orientation was towards control.

If we apply reinforcement principles to the features of this situation, we can see that the LWC child is not having his questioning positively reinforced. What is the point of asking questions if they either receive no answer or similar answers regardless of variation in substance? Language is being used to control and define role appropriate behaviour – and we might hazard a guess that question-asking is not an appropriate type of behaviour. Intrinsic motivation to find out is not being encouraged. On the other hand, the MC situation looks more Piagetian in terms of the child being presented with sets of categories and their relationships, extended backwards and forwards in time; opportunities are available for the accumulation of ordered knowledge. Question-asking itself is being generally and specifically reinforced. Language is used to mediate these events.

If doubts are expressed about the validity of the data themselves and/or the interpretations, we can appeal to at least three arguments. Firstly, we endeavoured to control interviewing in such a way that anxiety should not hamper replies and neither should the 'socially desirable' answers be readily available. Secondly, we can claim that these data are similar to those obtained by others (Hess and Shipman, 1967; Morton–Williams, 1967; Newson and Newson, 1970).

Finally, we examined the children's speech. Turner (1972) pursued a detailed linguistic analysis of the 'controlling' speech of five and seven year old children. Imperative modes were more common in LWC speech; MC children were more likely to refer to affective states of people and to make explicit reference to the obligations mentioned. Personal appeals were absent from the speech of both groups. Robinson and Rackstraw (1972) asked seven year old children from the sample to answer thirty probed 'wh' questions and found social class differences essentially similar to those found between mothers. The simplest hypothesis is that the differences in children's knowledge are a direct function of differences in what has been made available for them to learn.

Hess and Shipman (1967) observed mothers teaching their children how to sort blocks, and how to produce patterns on an 'Etch-a-Sketch' machine. Social class differences in mothers' teaching were considerable. On the block sorting task MC mothers were more likely to try to orient their children to the task, to try to motivate, to demand verbal feedback, to reward rather than punish responses made, and to use specific explicit language in instruction; their children were more successful at both sorting the blocks and explaining the basis of the sorting. In the 'Etch-a-Sketch' task, MC mothers were more likely to receive high ratings for the efficiency of their teaching, to show their children the patterns to be copied, and use specific rather than vague instructions. Their children were more successful.

Hess and Shipman comment on their results:

> 'The lack of meaning in the communication system between mother and child is clearly exemplified in the behaviour of many of the mothers on this task. Consider the plight of the child whose mother is low on these three measures: During the practice period, his mother demands that he turn his knob, but she fails to explain why or to relate it to the lines on the screen. During the task she doesn't show him the models and fails to give specific turning directions. For such children, the effects are these: (a) The child is not given a goal to make his individual responses meaningful (that is, he is not shown the model). (b) The mother is not specific in her directions: each new response is essentially a guess. (c) The sequence and pattern of response is not explained. The child has no way to tell ahead of time how to respond, and even after he does respond, he cannot predict the mother's reaction. He is hindered in learning anything from one response that will generalize to the next. (d) Nevertheless, his responses are being rewarded or punished, usually with maternal praise or disapproval, which provides belated feedback for a particular response if the mother is not giving specific directions. In either case, reward or punishment performs a motivating function.
>
> As a result of the interaction of these factors, the child is being made to produce responses that from his point of view are not related to any visible goal, are unrewarding in themselves, and do not bring corrective feedback that will enable him to avoid punishment.
>
> Nevertheless, reinforcement continues, and punishments are usually more frequent and intense than rewards. The parallel between this state of affairs and the experimental designs used by Maier (1949) deliberately to produce frustration in subhuman organisms is strikingly consistent. (Hess and Shipman, 1967, p. 79).

Lest it should be imagined that these few investigations are the sum total of our knowledge about social class differences in socialisation practices, we can refer to Bronfenbrenner's summary of the major studies conducted in the U.S.A. between 1928 and 1957 (1958) or the more than 500 references mentioned by Hess (1971). These allow us to specify a large number of attitudinal and behavioural differences that are found consistently. Here, however, we are interested only in sanctions and the occasion of their use. Most work is unfortunately conducted on the punitive rather than the rewarding aspects of parental behaviour. For example, Newson and Newson (1970) show differences in punitiveness. WC mothers being likely to be low smackers, and more likely to use deprivation, to issue threats of authority figures, of sending away or leaving themselves. More threats were unfulfilled; they were more likely to say 'I won't love you'. The rewarding side of life is not referred to, although the MC emerge as more child-centred in that they are more likely to treat the child as a person with rights as well as obligations. This use of smacks and unfulfilled threats of the working class and the child-centredness of the middle class is common through the literature. That much of the 'controlling' behaviour of MC parents is directed towards educational success for their children is likewise revealed in the succession of surveys that have been focused on school achievement (see p. 61). Studies showing high rewards are less frequent. Rosen and D'Andrade (1959) and Winterbottom (1958) show that high use of rewards of all kinds and especially parental approval is associated with high motivation to do well in the children and that this is a MC rather than a WC syndrome. (Rosen, 1956; McClelland, 1961). Kamii and Radin (1967) have shown that MC mothers are more responsive than WC mothers to explicit requests made by their children, are more likely to initiate affectionate interaction, and more gentle in their disciplining. Sears, Maccoby and Levin (1957) show greater warmth in the mother/child relationship in the middle class.

It is worth noting that psychologists have displayed an unhealthy measure of 'morbidity' in their obsessive concern with guilt and punishment and their lack of curiosity about the more enjoyable exchanges between mothers and children.

2.7.3. Extrinsic Motivation and the Middle Class

We have reported that MC parents are more involved in their children's educational progress, but it may be useful to think briefly about the predominant manipulative strategies of MC parents in relation to the school careers of their children. Evidence is of a relatively high helpfulness and interest in the child's progress and cooperativeness and involvement with the school and its agents. But the hope is also that the child will succeed. In general, MC children do succeed in jumping over the succession of hurdles and to keep the argument simple we will ignore the fates of those who fail. We need not ignore those for whom fear of parental disapproval is a significant feature of their motivation, since the modus operandi will be similar in the respects salient here to the dangers of rewarding success. Assume that a child is intrinsically motivated to solve a problem and he succeeds. We have already encountered Berlyne's argument that this success should strengthen both the enquiry behaviours that led to the solution and that the solution has an enhanced probability of being learned and remembered. However, the success may also be rewarded by the same significant other person's intervention through some verbal praise (Well done!), some non-verbal response (A beaming smile), or a material gift (Have a smartie!). On reinforcement principles of learning these rewards should become incentives for future success and one might expect the child to try to learn which responses will maximize such rewards. The danger from the point of view of intellectual development is not in the rewards per se, but in the possibility that the attempts to obtain such rewards become the predominating motivation. If this should happen, then the possibility arises that the child's focus will be on producing these pleasing responses to the extent that he becomes person rather than problem-centred. Instead of trying to solve problems, succeeding and incidentally being extrinsically rewarded, he may ignore the constraints of the problem and aim directly at producing the pleasing responses. The learning can be meaningless, the connection between problem and solution not understood. Who cares as long as the behaviour pleases Them or fails to annoy Them? To generalize the parody, the MC child can ignore meaningful learning and simply churn out the right answers.

Rote learning is not to be disparaged when the behaviour pleases or fails to annoy Them. To generalize the parody, the MC child may be encouraged to churn out right answers at the expense of meaningful learning.

The worry is not concerning rote learning as a process. Once the underlying concepts and relationships are understood, rote techniques may be the most sensible way of accumulating the many facts that it may be useful to have, *e.g.* capital cities of countries, geography of one's own town and region, names of cars or trees, French equivalents of foods, but when the technique is applied to facts and ideas which are not understood, its efficacy is diminished. How much education consists of thickly or thinly disguised rote learning of ill-understood knowledge is foolish to debate.

Certainly it appears to be common at university. Whole theories and evaluative arguments are fully swotted up and stamped in as well as the relevant experimental or other evidence. It is particularly off-key to find students learning Piagetian concepts and ideas by heart with little attempt at accommodation and no adequate schemas for assimilating the theory. Instrinsic motivation is forgotten. There is no time to feed interests when examinations* require masses of accumulated information across a whole range of topics. The overtly expressed intention is to produce examiner-pleasing responses or to use the transatlantic barbarism – 'to psych out the teacher'. Such learning is a far remove from the corresponding objective in the Robbins quartet 'the enhancement of the general powers of the mind' (Committee on Higher Education (Robbins), 1963). As a psychologist interested in minds and their workings, I am staggered by the capacities of the brains of undergraduates to sponge up and cram in the masses of material for later emission in examinations – and I am distressed, but not surprised, at the inability of these same minds to reorganise, cross-reference or otherwise redeploy what they have learned. Retrieval is closely linked to contexts of acquisition – a clear sign of rote-learning with minimal development of meaningfulness. Academics would wish to deny the charge, which is what one would expect; they will not, alas, rush out to collect evidence to show whether these ideas are libellous or not.

We may, however, note advantages that the MC child has over his WC peer; he has got the facts in his head and he has not been put off learning. The items absorbed are available for reorganization and restructuring if opportunity is given or occasion demands. He has not built up defences or become crippled with anxiety whose exorcism will be a prior condition of subsequent learning.

If the institutions most favoured to develop independent and critical thinking are placing high value on response-learning by the external incentives and sanctions they employ and a low value on intrinsic motivation, what is happening in the rest of the tertiary sector and at the secondary level?

Intrinsic motivation is in its very nature problem-oriented, but once external incentives have not only supplemented but have supplanted it, the orientation is switched. Perhaps some such explanation helps to account of the discrepancy between what we are like and what we could be like if Piaget's intellectually mature man were enabled to develop.

No doubt the superficial reader will be able to glean an attack on rote-learning and examinations, yet another cry for the value of 'guided discovery' methods and demand to know who is to blame, the children, their parents, their teachers or the system? It may therefore be appropriate to point out that it is rote-learning without understanding that is unnecessary; and we must note that it would be as inefficient to encourage children to learn the stem changes and meanings of German strong verbs by discovery methods as it would to hope that their understanding of some concept or principle will be enhanced if it is only repeated a sufficient number of times. It is not examinations as an assessment technique that is being questioned, but possible discrepancies between what they are intended to be and what they in fact do, given their present content. It is not a matter of who is to blame; it is a matter of increased understanding allowing the possibility of people realizing possible discrepancies between the ends they are pursuing and the means they are adopting.

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*Examinations need not of course require set answers that can be prepared in advance. As with rote learning it is important to separate the technique from the content.

With this reminder that not all may be as it seems to be with MC children and their education, we can return to summarise the fate of the 'intrinsic motivation' of his LWC peer.

2.7.4. Lower Working Class Children and their Socialization: Summary

1. The family is the primary source of knowledge about the world for young children. Relative to the MC family, the LWC family is not providing as much knowledge, it is less forthcoming in amount and accuracy. It is not providing the means to acquire and make independent evaluation of knowledge, nor is it encouraging the intrinsic motivation for any of these activities.
2. The enquiry behaviours of LWC children are not rewarded either extrinsically by incentives or intrinsically by the filling of gaps in knowledge. Absence of reward is not the whole story, however. Hess and Shipman (among many others) have observed a higher incidence of punishment in 'learning' situations which presumably acts both to suppress relevant enquiry behaviours, and in the long run perhaps, the motivation to enquiry. In Piagetian terms, attempts at adaptation through accommodation become less likely. In Berlyne's terms, extrnisic motivation not to enquire is more likely to become dominant over any intrinsic motivation to do so. Boredom is safer than punishment. Furthermore, we have seen that answers given to both empirical and moral questions are likely to be presented as the received doctrine of the culture; the social order will be preserved and reproduced.
3. The knowledge acquired by LWC children is less likely to be ordered into systems. Categories of experience are not articulated to encourage the development of symbolic control over the objects of thinking. The MC children look to be receiving knowledge tailored for progression through Piagetian stages of development.
4. One significant discriminating feature lies in the differential command of the representational function of language. The LWC child is characterised by a relative inability to represent knowledge symbolically (logical, empirical, moral, aesthetic and metaphysical), thereby restricting possibilities of efficient verbal communication to others, except in simple prescriptions or descriptions of a concrete and particular variety, and reducing the chances of the generation of internal conceptual conflicts and gaps which can then be resolved or filled by restructuring available evidence or acquiring new evidence. Skills in the verbal formulation of problems as questions and skills in the generation and evaluation of answers are likely to be depressed.

With such a cloud of witnesses testifying to the pattern of results reported, we may be thought uncharitable in doubting their authenticity. But we also felt obliged to respond to the clarion call of modern primary educational theory: 'I hear, I forget; I see, I remember; I do, I understand'. If we ignore the presumptive inaccuracy of its literal meaning, we can still catch the spirit of the maxim and engage in a little doing as well as reading.

Hence, we decided to replicate some of the basic designs, elaborating them to tease out relationships among surprises, relevance, value, interest, questioning, comprehension, and learning, and to skirmish briefly with social class (Chapter 3).

Duly convinced and in addition persuaded that curiosity is positively associated with learning, we could turn to the examination of social class differences in boredom which would be predicted on the basis of the ideas expressed in section 2.7.4. After examining the anticipated social class differences in strategies of finding out and proficiency at question-asking, we concentrate upon problems of enhancing curiosity in WC children.

2.8 Bibliography

Acker, M. & McReynolds, P. The 'need for novelty': a comparison of six instruments. *Psychol. Rec.*, 1967, *17*, 177-182.

Aikawa, T. & Horiuchi, S. A Study of the development of 'whys': I. Investigations in the areas of 'whys' which arise as a process of cognizing reality. *Jap. J. educ. Psychol.*, 1962, *10*, 139-149.

Alabi, F.D. *Curiosity, formal and informal schools.* Birmingham: Unpublished Diss. Dip. Child Psychol., 1959. (cited by Ashton, 1965).

Arasteh, J.D. Creativity and related processes in the young child: a review of the literature. *J. genet. Psychol.*, 1968, *112*, 77-108.

Argyle, M. & Little, B.R. Do personality traits apply to social behaviour? *J. theory soc. Beh.*, 1972, *2*, 1-35.

Ashton, P.M.E. *A study of the curiosity of 10- and 11-year old children.* Birmingham: Unpublished Ph.D. thesis, 1965.

Attneave, F. *Applications of information theory to psychology.* New York: Holt, 1956.

Ausubel, D.P. *Educational psychology: a cognitive view.* New York: Holt, Rinehart & Winston, 1968.

Ausubel, D.P. & Robinson, F.G. *School learning.* New York: Holt, Rinehart & Winston, 1969.

Barron, F. Complexity-simplicity as a personality dimension. *J. abnorm. soc. Psychol.*, 1953, *48*, 163-172.

Barron, F. *Creativity and psychological health.* Princeton, New Jersey: Van Nostrand, 1963.

Berlyne, D.E. A theory of human curiosity. *Brit. J. Psychol.*, 1954, *45*, 180-191 (a).

Berlyne, D.E. An experimental study of human curiosity: *Brit. J. Psychol.*, 1954, *45*, 256-265 (b)

Berlyne, D.E. Conflict and information theory variables as determinants of human perceptual curiosity. *J. exp. Psychol.*, 1957, *53*, 399-404.

Berlyne, D.E. The influence of complexity and novelty in visual figures on orienting responses. *J. exp. Psychol.*, 1958, *55*, 289-296 (a).

Berlyne, D.E. Supplementary report: complexity and orienting responses with longer exposures. *J. exp. Psychol.*, 1958, *56*, 183 (b).

Berlyne, D.E. The influence of the albedo and complexity of stimuli on visual fixation in the human infant. *Brit. J. Psychol.*, 1958, *49*, 315-318 (c).

Berlyne, D.E. *Conflict, arousal and curiosity.* New York: McGraw-Hill, 1960.

Berlyne, D.E. Uncertainty and epistemic curiosity: *Brit. J. Psychol.*, 1962, *53*, 27-34.

Berlyne, D.E. Motivational problems raised by exploratory and epistemic behaviour. In S. Koch (Ed.) *Psychology: a study of a science. Vol. 5.* New York: McGraw-Hill, 1963 (a).

Berlyne, D.E. Complexity and incongruity as determinants of exploratory choice and evaluative ratings. *Canad. J. Psychol.*, 1963, *17*. 274-290 (b).

Berlyne, D.E. Novelty. *New Society*, 1964, *87*, 23-24.

Berlyne, D.E. Curiosity and education. In J.D. Krumboltz (Ed.) *Learning and the educational process.* Chicago: Rand-McNally, 1965.

Berlyne, D.E. Curiosity and exploration. *Science*, 1966, *153*, 25-33(a).

Berlyne, D.E. Conditions of prequestioning and the retention of meaningful material. *J. educ. Psychol.*, 1966, *57*, 128-132(b).

Berlyne, D.E. Arousal and reinforcement. *Nebraska Symposium Motivation*, 1967, *15*, 1-110.

Berlyne, D.E. Art, humour and play. In G. Lindzey & E. Aronson (Eds) *Handbook of social psychology* (2nd ed.). Reading, Mass.: Addison-Wesley, 1968.

Berlyne, D.E. Children's reasoning and thinking. In P.H. Mussen (Ed.) *Revised edition of Carmichael's manual of child Psychology*. New York: Wiley, 1970 (a).

Berlyne, D.E. Novelty complexity and hedonic value. *Percept. & Psychophys.* 1970, *8*, 279-286 (b).

Berlyne, D.E., Carey, S.T., Lazare, S.A., Parlow, J. & Tiberius, R. Effects of prior guessing on intentional and incidental PA learning. *J. verb. learn. verb. Behav.*, in press.

Berlyne, D.E. & Frommer, F.D. Some determinants of the incidence and content of children's questions. *Child Develpm.*, 1966, *37*, 177-189.

Berlyne, D.E. & Lawrence, G.H. Effects of complexity and incongruity variables on exploratory behaviour and verbally expressed preference. *J. gen. Psychol.*, 1964, *71*, 21-45.

Berlyne, D.E. & Lewis, J.L. Effects of heightened arousal on human exploratory behaviour. *Canad. J. Psychol.*, 1963, *17*, 398-410.

Berlyne, D.E. & Parham, L.C. Determinants of subjective novelty. *Percept. & Psychophys.*, 1968, *3*, 415-423.

Bernstein, B. *Social class, codes and control.* London: Routledge, 1972.

Black, K.N., Williams, T.M. & Brown, D.R. A developmental study of preschool children's preference for random forms. *Child Develpm.*, 1971, *42*, 57-61.

Blank, S.S. & Covington, M. Inducing children to ask questions in solving problems. *J. educ. Res.*, 1965, *59*, 21-27.

Bronfenbrenner, U., Socialization and social class through time and space. In E.E. Maccoby, T.M. Newcomb and E.L. Hartley (Eds), *Readings in social psychology.* New York : Holt, 1958, 400-525.

Brown, L.T. Further studies of the attentional responses of humans and squirrel monkeys to visual patterns. *Percept. mot. Skills*, 1967, *25*, 397-406.

Bruner, J.S. On cognitive growth: In J.S. Bruner *et al. Studies in cognitive growth.* New York: Wiley, 1966.

Bryson, J.B. & Driver, M.J. Conceptual complexity and internal arousal. *Psychon. Sci.*, 1969, *17*, 71-72.

Burgess, S.E. *A study of curiosity as motivation for a key-pressing response in children.* Aberdeen: Unpublished B.Ed., thesis, 1956 (cited by Berlyne, 1957).

Butcher, H.J. *Human intelligence: its nature and assessment.* London: Methuen, 1968.

Cantor, G.N. Children's 'like-dislike' ratings of familiarized and non-familiarized visual stimuli. *J. exp. child Psychol.*, 1968, *6*, 651-657.

Cantor, G.N. Effects of stimulus familiarization on child behaviour. In J.P. Hill (Ed.) *Minnesota symposia on child psychology. Vol. 3*, Minneapolis: Univ. of Minnesota, 1969.

Cantor, G.N., Cantor, J.H. & Dittrichs, R. Observing behaviour in preschool children as a function of stimulus complexity. *Child Develpm.*, 1963, *34*, 683-689.

Cantor, G.N. & Kubose, O.K. Preschool children's ratings of familiarized and non-familiarized visual stimuli. *J. exp. child Psychol.* 1969, *8*, 74-81.

Caron, A.J. Curiosity, achievement and avoidant motivation as determinants of epistemic behaviour. *J. abnorm. soc. Psychol.*, 1963, *67*, 535-549.

Clapp, W.F. & Eichorn, D.H. Some determinants of perceptual investigatory responses in children. *J. exp. child Psychol.*, 1965, *2*, 371-388.

Committee on Higher Education. *Higher education* (Robbins). London: H.M.S.O., 1963 (b).

Crandall, J.E. Satiation of interest in words as a function of their familiarity. *J. verb. learn verb. Behav.*, 1967, *6*, 398-402.

Davie, R., Butler, N., & Goldstein, H. *From birth to seven.* London: Longmans, 1972.

Davis, E.A. The form and function of children's questions. *Child Develpm.*, 1932, *3*, 57-75.

Day, H. A brief note on the Berlyne/Heckhausen controversy. *Psychol. Repts.* 1965, *70*, 225-226.

Day, H. Exploratory behaviour as a function of individual differences and level of arousal. *Diss. Abs.*, 1966, *26B*, 5556(a).

Day, H. Looking time as a function of stimulus variables and individual differences. *Percept. mot. Skills*, 1966, *22*, 423-428(b).

Day, H. A subjective definition of complexity. *Percept. mot. Skills*, 1967, *25*, 583-584(a).

Day, H. Evaluations of subjective complexity, pleasingness and interestingness for a series of random polygons varying in complexity. *Percept. & Psychophys.*, 1967, *2*, 281-286(b).

Day, H. The importance of symmetry and complexity in the evaluation of complexity, interest and pleasingness. *Psychon. Sci.*, 1968, *10*, 339-340(a).

Day, H. Role of specific curiosity in school achievement. *J. Educ. Psychol.*, 1968, *59*, 37-43(b).

Day, H. A curious approach to creativity. *Canad. Psychologist*, 1968, *9*, 485-497(c).

Dorn, M.S. A study of the questions asked by kindergarten children. *Diss. Abs.*, 1967, *27B*, 621.

Douglas, J.W.B. *The home and the school.* London: MacGibbon & Kee, 1964.

Douglas, J.W.B., Ross, J.M. and Simpson, H.R. *All our future*, London: Panther, 1968.

Duke, A.W. & Gullickson, R.G. Children's stimulus selection as a function of auditory stimulus complexity. *Psychon. Sci.*, 1970, *19*, 119-120.

Eisenman, R. Novelty ratings of simple and complex shapes. *J. gen. Psychol.*, 1968, *78*, 275-278.

Eisenman, R. Creativity, awareness and liking. *J. consult. clin. Psychol.*, 1969, *33*, 157-160.

Evans, D.R. Conceptual complexity, arousal and epistemic behaviour. *Canad. J. Psychol.*, 1970, *24*, 249-260.

Eysenck, H.J. *The dynamics of anxiety and hysteria.* London: Routledge, 1957.

Fahey, G.L. The questioning activity of children. *J. genet. Psychol.*, 1942, *60*, 337-357.

Fahey, G.L. & Corey, S.M. Inferring level of mental activity from pupils' classroom questions. *J. educ. Res.*, 1941, *35*, 193-200.

Faw, T.T. The effect of stimulus incongruity on the free looking time of adults and children. *Psychon. Sci.*, 1970, *19*, 335-337.

Faw, T.T. & Nunnally, J.C. The influence of stimulus complexity, novelty and affective value on children's visual fixations. *J. exp. child Psychol.*, 1968, *6*, 141-153(b).

Faw, T.T. & Nunnally, J.C. The influence of stimulus incongruity on the familiarity effect in visual selection. *Per. & Psychophys.*, 1971, *9*, 150-152.

Faw, T.T., Nunnally, J.C. & Ator, N.A. The influence of stimulus uncertainty and experimental instructions on visual selection. *Percept. & Psychophys.*, 1969, *5*, 137-140.

Faw, T.T. & Pien, D. The influence of exposure on rated preference: effects of age, pattern of exposure, and stimulus meaningfulness. *J. exp. child Psychol.*, 1971, *11*, 339-346.

Finley, C.W. Some studies of children's interests in science materials. *Sch. Sci. & Meth.*, 1921, *11*, 1-24 (cited by Fahey, 1942).

Flick, G.L. Attention to colour form stimuli as a function of stimulus parameters and the level of adaptation in normal and mentally retarded children. *Diss. Abs.*, 1970, *30B*, 5687.

Fowler, H. *Curiosity and exploratory behaviour.* London: Macmillan, 1965.

Friedlander, B.Z. A psychologist's second thoughts on concepts, curiosity and discovery in teaching and learning. *Harvard. Educ. Rev.*, 1965, *35*, 18-38.

Friedlander, B.Z. Effects of stimulus variation, ratio contingency, and intermittent extinction on a child's incidental play for perceptual reinforcement. *J. exp. child Psychol.*, 1966, *4*, 257-265.

Gatto, F.M. Pupils' questions – their nature and their relationship to the study process. *Univ. of Pittsburgh Bull.*, 1929, *26*, 65-71.

Golann, S.E. The creativity motive. *J. Pers.*, 1962, *30*, 580-600.

Golann, S.E. Psychological study of creativity. *Psychol. Bull.*, 1963, *60*, 548-565.

Greenberger, E., Woldman, J. & Yourshaw, S.W. Components of curiosity: Berlyne reconsidered. *Brit. J. Psychol.*, 1967, *58*, 375-386.

Hebb, D.O. *The Organization of Behaviour.* New York: Wiley, 1949.

Hebb, D.O. Drives and the C.N.S. (Conceptual nervous system). *Psychol. Rev.*, 1955, *62*, 243-254.

Helseth, I.O. Children's thinking: a study of the thinking done by a group of 7th and 8th grade children when encouraged to ask questions about U.S. History. *Teach. coll. Columbia Univ. Contrib. Educ.*, 1926, No. 209 (cited by Fahey, 1942).

Hess, R.D. Class and ethnic influences upon socialization. In P.H. Mussen (Ed.) *Carmichael's manual of child psychology, Vol. 2,* New York: Wiley, 1970.

Hess, R.D. and Shipman, V.C. Cognitive elements in maternal behaviour. In J.P. Hill (Ed.), *Minnesota symposia on child psychology. Vol. I.,* Minneapolis: Univ. of Minnesota. 1967.

Hoats, D.L., Miller, M. B. & Spitz, H.H. Experiments on perceptual curiosity in mental retardates and normals. *Amer. J. ment. Def.*, 1963, *68*, 386-395.

Holt. J. *How children fail.* Harmondsworth: Penguin, 1969.

Houston, J.P. & Mednick, S.A. Creativity and the need for novelty. *J. abnorm. soc. Psychol.*, 1963, *66*, 137-141.

Hovey, D.E., Gruber, H.E. & Terrell, G. Effects of self-directed study on course achievement, retention and curiosity. *J. educ. Res.*, 1963, *56*, 346-351.

Hull, C.L. *Principles of behaviour.* New York: Appleton-Century-Crofts, 1943.

Hunt, J. McV. Piaget's observations as a source of hypotheses concerning motivation. *Merrill-Palmer Quart.*, 1963, *9*, 263-275.

Hunt, J.McV., Intrinsic motivation and its role in psychological development. *Nebraska Symposium on Motivation,* 1965, *13*, 189-282.

Husen, T. *Social bakcground and educational career.* Paris: O.E.C.D. (C.E.R.I.), 1972.

Hutt, C. Exploration and play in children. *Symp. Zool. Soc. London.* 1966, *18*, 61-81.

Hutt, C. Curiosity in young children. *Science J.*, 1970, *6*, 68-71. (a).

Hutt, C. Specific and diversive exploration. In H. Reese & L.P. Lipsitt (Eds) *Advances in child development and behaviour. Vol. 5.* New York: Academic Press, 1970. (b).

Hutt, C. & McGrew, P.L. Do children really prefer complexity? *Psychon. Sci.*, 1969, *17*, 113-114.

Isaacs, S. *Intellectual growth in young children.* With an appendix on children's 'why' questions by N. Isaacs. London: Routledge, 1930.

Jersild, A.T. & Tasch, R.J. *Children's interests.* New York: Teachers' College, Columbia Univ., 1949.

Kagan, J. *Change and continuity in infancy,* New York: Wiley, 1971.

Kamii, C.K. and Radin, N.L. Class differences in the socialization practices of Negro mothers. *J. Marr., Family,* 1967, *29,* 302-310.

Labov, W. The logic of non-standard English. In F.W. Williams (ed.) *Language and poverty.* Chicago: Markham, 1970.

LaCrosse, E.R. The relationship of biological sex, psychological sex, intelligence and perceptual rigidity to visual exploratory behaviour in 2nd and 6th grade, white, southern, rural children. *Diss. Abs.,* 1967, *278,* 2860.

Langevin, R. Is curiosity a unitary construct? *Canad. J. Psychol.,* 1971, *25,* 360-374.

Lawton, D. *Social class, language and education.* London: Routledge, 1968.

Leckart, B.T. Looking-time: the effects of stimulus complexity and familiarity. *Percept. & Psychophys.,* 1966, *1,* 142-144 (b).

Leckart, B.T. & Bakan, P. Reliability of looking time. *Percept. & Psychophys.,* 1969, *5,* 313-314.

Leuba, C. Toward some integration of learning theories: the concept of optimal stimulation. *Psychol. Rep.,* 1955, *1,* 27-33.

Leuba, C. & Friedlander, B.Z. Effects of controlled audio-visual reinforcement on infants' manipulative play in the home. *J. exp. child Psychol.,* 1968, *6,* 87-99.

Lewis, M. & Goldberg, S. The acquisition and violation of expectancy: an experimental paradigm. *J. exp. child Psychol.,* 1969, *7,* 70-80.

Lewis, M., Goldberg, S. & Rausch, M. Attention distribution as a function of novelty and familiarity. *Psychon. Sci.,* 1967, *7,* 227-228.

Lintz, L.M., Starr, R.H. & Medinnus, G.R. Curiosity reward in children. *Psychol., Repts.,* 1965, *16,* 331-341.

Livson, N. Towards a differentiated construct of curiosity. *J. genet. Psychol.,* 1967, *111,* 73-84.

Maas, I. Motivation in school learning with particular reference to curiosity. Birmingham: unpub. report, 1959 (cited by Ashton, 1965).

McCarthy, D. Language development of the preschool child. *Inst. child Welfare Monog.,* No. 4, Minneapolis: Univ. Minnesota Press, 1930.

Maccoby, E.E. *The development of sex differences.* London: Tavistock, 1967.

McClelland, D.C. *The achieving society.* New York: van Nostrand, 1961.

McReynolds, P. A restricted conceptualization of human anxiety and motivation. *Psychol. Repts.,* 1956, *2,* 293-312.

McReynolds, P. Exploratory behaviour as related to anxiety in psychiatric patients. *Psychol. Repts.,* 1958, *4,* 321-322.

McReynolds, P. Reactions to novel and familiar stimuli as a function of schizophrenic withdrawal. *Percept. mot. Skills,* 1963, *16,* 847-850.

McReynolds, P., Acker, M. & Pietila, C. Relation of object curiosity to psychological adjustment in children. *Child Develpm.,* 1961, *32,* 393-400.

Matlin, M.W. Response competition, recognition and affect. *J. pers. soc. Psychol.* 1971, *19,* 295-300.

Mau, L.E. Some experiments regarding the relative interests of children in physical and biological materials in the kindergarten and primary grades. *Nat. Stud. Rev.,* 1912, *8,* 285-291.

Maw, W.H. *A definition of curiosity: a factor analysis study.* Co-op. Research Project S-109, Univer. of Delaware, 1967.

Maw, W.H. & E.W. Establishing criteria for evaluating measures of curiosity. *J. exp. Educ.*, 1961, *29*, 299-306. (a).

Maw. W.H. & E.W. Information recognition by children with high and low curiosity. *Educ. res. Bull.*, 1961, *40*, 197-201. (b).

Maw, W.H. & E.W. Selection of unbalanced and unusual designs by children high in curiosity. *Child Develpm.*, 1962, *33*, 917-922. (a).

Maw, W.H. & E.W. Children's curiosity as an aspect of reading comprehension. *The Reading Teacher*, 1962, *15*, 236-240. (b).

Maw, W.H. & E.W. The differences between the scores of children with high curiosity and children with low curiosity on a test of general information. *J. educ. Res.*, 1963, *57*, 76-79.

Maw, W.H. & E.W. *An exploratory investigation into the measurement of curiosity in elementary school children.* Co-op Research Project 801, Univer. of Delaware, 1964.

Maw, W.H. & E.W. *Personal and social variables differentiating children with high and low curiosity.* Co-op. Research Project 1511, Univer. of Delaware, 1965. (a).

Maw, W.H. & E.W. Differences in preferences for investigatory activities by school children who differ in curiosity level. *Psychol. in the Schools*, 1965, *2*, 263-266. (b).

Maw, W.H. & E.W. Children's curiosity and parental attitudes. *J. Marriage & Family*, 1966, *28*, 343-345.

Maw, W.H. & E.W. Self-appraisal of curiosity. *J. educ. Res.*, 1968, *61*, 462-265.

Maw, W.H. & E.W. Self-concepts of high and low curiosity boys. *Child Develpm.*, 1970, *41*, 123-129. (a).

Maw, W.H. & E.W. Nature of creativity in high and low curiosity boys. *Develpm. Psychol.*, 1970, *2*, 325-329. (b).

Medinnus, G.R. & Love, J.M. The relationship between curiosity and security in preschool children. *J. genet. Psychol.*, 1965, *107*, 91-98.

Melchert, J.C. Novelty and change in the perceptual curiosity of children. *Diss. Abs.*, 1967, *28A*, 2098.

Mendel, G. Children's preferences for differing degrees of novelty. *Child Develpm.*, 1965, *36*, 453-465.

Mittman, L.R. & Terrell, G. An experimental study of curiosity in children. *Child Develpm.*, 1964, *35*, 851-855.

Morton-Williams, R. Survey among parents of primary school children. Appendix 3. *Children and their primary schools.* London: H.M.S.O., 1967.

Morton-Williams, R., & Finch, S. Schools Council Enquiry 1. *Young school leavers.* London: H.M.S.O., 1968.

Mosher, F.A. & Hornsby, J.R. On asking questions. In J.S. Bruner, *et. al, Studies in cognitive growth*, New York: Wiley, 1966.

Moss, H.A. & Robson, K.S. Maternal influences in early social and visual behaviour. *Child Develpm.*, 1968, *39*, 401-408.

Moss, H.A. & Robson, K.S. The relation between the amount of time infants spend at various states and the development of visual behaviour. *Child Develpm.*, 1970, *41*, 509-517.

Newson, E. & Newson, J. *Four years old in an urban community.* Harmondsworth: Penguin, 1970.

Nicki, R.M. The reinforcing effect of uncertainty reduction on a human operant. *Canad. J. Psychol.*, 1970, *24*, 389-400.

Nicki, R.M. & Shea, J.F. Learning, curiosity, and social group membership. *J. exp. child Psychol.*, 1971, *11*, 124-132.

Nunnally, J.C., Faw, T.T. & Bashford, M.B. The effects of degrees of incongruity on visual fixation in children and adults. *J. exp. Psychol.*, 1969, *81*, 760-764.

Pangrac, I.E. The relationship of curiosity in children to the child's perception of selected dimensions of parental behaviour. *Diss. Abs.*, 1964, *24*, 5532.

Paradowski, W. The effect of curiosity on incidental learning. *J. educ. Psychol.*, 1967, *58*, 50-55.

Pearson, P.H. Relations between global and specified measures of novelty seeking. *J. consult. clin. Psychol.*, 1970, *34*, 199-204.

Penney, R.K. Reactive curiosity and manifest anxiety in children. *Child Develpm.*, 1965, *36*, 697-702.

Penney, R.K. & McCann, B. The children's reactive curiosity scale. *Psychol. Repts.*, 1964, *15*, 323-334.

Penney, R.K. & Reinehr, R.C. Development of a stimulus-variation seeking scale for adults. *Psychol. Repts.*, 1966, *18*, 631-638.

Peters, R.D. & Penney, R.K. Spontaneous alternation of high and low reactively curious children. *Psychon. Sci.*, 1966, *4*, 139-140.

Piaget, J. *The language and thought of the child.* London: Routledge, 1952 (first published 1924).

Piaget, J. & Inhelder, B. *The psychology of the child*, London: Routledge, 1969.

Pielstick, N.L. & Woodruff, A.B. Exploratory behaviour and curiosity in two age and ability groups of children. *Psychol. Repts.*, 1964, *14*, 831-838.

Pielstick, N.L. & Woodruff, A.B. Exploratory behaviour in children. *Psychol. Repts.*, 1968, *22*, 515-531.

Pollock, C.A. Children's questions as a basis of what to teach in general science. *Educ. Res. Bull.*, 1924, *3*, 3-6.

Pritchard, M.F. Children's classroom questions – How many? What kind? Their effects on individual growth. *Diss. Abs.*, 1970, *30A*, 3353.

Rheingold, H.L. The effect of environmental stimulation upon social and exploratory behaviour in the human infant. In B.M. Foss (Ed.) *Determinants of Infant Behaviour.* London: Methuen, 1961.

Robinson, W.P. *Language and social behaviour.* Harmondsworth: Penguin, 1972. (a).

Robinson, W.P. Where do children's answers come from? In B.B. Bernstein (Ed.) *Social class, codes and control. Vol. 2.* London: Routledge, 1972. (b).

Robinson, W.P. & Rackstraw, S.J. *A question of answers.* London: Routledge, 1972.

Rosen, B.C. The achievement syndrome : a psychocultural dimension of social stratification. *Amer. sociol. Rev.*, 1956, *21*, 203-211.

Rosen, B.C. & D'Andrade, R.C. The psychosocial origins of achievement motivation. *Sociometry*, 1959, *22*, 185-218.

Rosenshield, D.B. Curiosity on organismic approach. Theory and research. *Diss. Abs.*, 1968, *288*, 3480-3481.

Rothkopf, E.Z. Some theoretical and experimental approaches to problems in written instruction. In J.D. Krumboltz (Ed.) *Learning and the educational process.* Chicago: Rand McNally, 1965.

Rubenstein, J. Maternal attentiveness and subsequent exploratory behaviour in the infant. *Child Develpm.*, 1967, *38*, 1089-1100.

Rump, E.E. Is there a general factor of preference for complexity? *Percept. & Psychophys.*, 1968, *3*, 346-348.

Saxe, R.M. & Stollak, G.E. Curiosity and the parent-child relationship. *Child Develpm.*, 1971, *42*, 373-384.

Schatzman, R. & Strauss, A. Social class and modes of communication. *Amer. J. Sociol.*, 1955, *60*, 329-338.

Scovel, D.A. A study analyzing high school student questioning behaviour in American history classes. *Diss. Abs.*, 1969, *29A*, 4390-4391.

Sears, R.R., Maccoby, E.E. & Levin, H. *Patterns of child rearing.* Evanston, Ill.: Row, Peterson, 1957.

Skinner, B.F. Contingency management in the classroom. *Bull. Brit. Psychol. Soc.*, 1969, *22*, 224 (abstract).

Smith, M.E. The influence of age, sex and intelligence on the frequency and form of questions asked by preschool children. *Child Develpm.*, 1933, *4*, 201-213.

Smock, C.D. & Holt, B.D. Children's reactions to novelty: an experimental study of "curiosity motivation", *Child Develpm.*, 1962, *33*, 631-642.

Stern, W. *Psychology of early childhood.* New York: Holt, 1924 (cited by Fahey, 1942).

Stirling, M.E. *An analysis of questions asked by a group of preschool children in a controlled setting.* Toronto: Unpublished M.A. thesis, 1937, (cited by Berlyne, 1970a).

Suchman, J.R. Inquiry training: building skills for autonomous discovery, *Merrill-Palmer Quart.*, 1961, *7*, 147-169.

Thomas, H. Discrepancy hypotheses: methodological and theoretical considerations. *Psychol. Rev.*, 1971, *78*, 249-259.

Torrance, E.P. *Guiding creative talent.* Englewood Cliffs, N.J.: Prentice-Hall, 1962.

Torrance, E.P. Group size and question asking performance of preprimary children. *J. Psychol.*, 1970, *74*, 71-75. (a).

Torrance, E.P. Freedom to manipulate objects and question asking performance of 6 year olds. *Young Children*, 1970, *26*, 93-17. (b)

Turner, G.J. Social class and children's language of control at ages five and seven. In B. Bernstein (ed.) *Class, codes and control. Vol. 2.* London: Routledge, 1973.

Weintraub, H. Case studies of boys identified as high or low in curiosity. *Diss. Abs.*, 1969, *29A*, 2046-2047.

White, B.L. & Castle, P.W. Visual exploratory behaviour following postnatal handling of human infants. *Percept. mot. Skills*, 1964, *18*, 497-502.

White, R.W. Motivation reconsidered: the concept of competence. *Psychol. Rev.*, 1959, *66*, 297-333.

Williams, F.W. (Ed.) *Language and poverty.* Chicago: Markham, 1970.

Williams, F. & Naremore, R.C. On the functional analysis of social class differences in modes of speech. *Speech Monogr.* 1969, *36*, 77-102.

Winterbottom, M.R. The relation of need for achievement to learning experiences in independence and mastery. In J.W. Atkinson (Ed.) *Motives in fantasy, action and society.* New York: van Nostrand, 1958.

Witkin, H.A., Dyk, R.B., Faterson, K.F., Goodenough, D.R. & Karp, S.A. *Psychological differentiation.* New York: Wiley, 1962.

Yamamoto, K. Development of ability to ask questions under specific testing conditions. *J. genet. Psychol.*, 1962, *101*, 83-90.

Young, F.M. Causes for loss of interest in high school subjects as reported by 631 college students. *J. educ. Res.*, 1932, *25*, 110-115.

Zajonc, R.B. Attitudinal effects of mere exposure. *J. pers. soc. Psychol. (Monogr. Supp.).* 1968, 9, No. 2, Part 2.

Addendum

Davis, R.M.S. A study of the relationship between pupil questions and selected variables. *Diss. Abs.*, 1971, *31A*, 5027-5028.

CHAPTER 3 DETERMINANTS OF CURIOSITY AND QUESTIONS ASKING (M.G. DUFFY)

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CHAPTER 3

DETERMINANTS OF CURIOSITY AND QUESTION ASKING (M.G. DUFFY)

3.1 General Introduction

Three experimental studies were conducted into an examination of possible determinants of question asking, all within the framework of Berlyne's approach to curiosity. The first experimental study was run when we were still optimistic about the feasibility of making social class comparisons, but the fact that we had to obtain our MC and WC boys for these from different schools was one of the early signs that social class was not a feasible complex of variables to use with children of this age in our area. Since we had no practical experience of looking at 'collative properties of stimuli' in relation to inspection times, question asking or hypothesis generation, we were in part concerned simply to try our hand. However, we introduced two variations into the standard situations mentioned earlier (see chapter 2). First, of the three types of oddity used, two were social psychological rather than physical. While the third set of pictures presented objects with odd attributes (green pillar box), the first two offered, respectively, pairs of people playing the reverse of their customary roles (teacher in desk, child by blackboard) and individuals whose emotional expressions were in conflict with the role being performed (nurse looking angry and pulling a patient's hair). Each incongruous picture had a normal sibling, and we wished to see whether the incongruity affected the time spent looking at each picture and the number of questions asked about it. We combined this with an hypothesis derived from Bernstein's (1970) views about child development. He has argued for relatively rigid definitions of roles in the lower working class. If this is true then LWC subjects should experience more conflict and hence look for longer. What should happen with questions is difficult to predict. If children are asked to explain anomaly, then MC children should have a greater facility for integrating the oddity within the bounds of normal experience.

We should have liked to follow up this initial investigation with other stimulus materials and more satisfactorily differentiated groups of subjects, but the local absence of the latter forced us to abandon the project. This is to be regretted because the discovery of social class differences with such materials might have had implications for the teaching of such subjects as history, human geography and social studies.

Instead, we decided to look at one general aspect of determinants of question asking: whether children's ratings of interest could be used to predict the number of questions they would ask. If we assume (but we need to examine) that the number and type of questions children have could enable us to predict the type and amount of effort they would invest in the exploration of a topic, then we would have isolated one technique for relying on intrinsic rather than wholly extrinsic motivation for facilitating their pursuit of knowledge; they would be finding out about a topic because they wanted to rather than because they would be in trouble *etc.* if they did not.

If children's ratings of their own interest were to bear no relation to their questioning behaviour, then the search would have to begin again; if they were to, then such ratings could be employed as a guide to the likely effort and enthusiasm they would invest. The first study in fact shows relationships between interest and questions asked. From what does this interest stem? The second study looks at two possible determinants of interest, surprisingness and value, and is supplemented by an analysis of the relationships between these variables and comprehension and retention.

3.2 Study I: The Relationships of Role-Reversal, Role-Behaviour Conflict and Inappropriateness of Attributes to Question Asking*

(W.P. Robinson & M.G. Duffy)

3.2.1. Introduction

According to Berlyne's (1960) stimulus-response theory, curiosity behaviour is a consequence of perceptual or conceptual conflict arising from competing symbolic responses aroused by 'collative' properties of stimulation, that is to say, properties which lead the organism to compare present with past experience. Examples of such collative properties are novelty, incongruity, surprisingness and uncertainty. Berlyne's own research has indicated that manipulation of the values of these variables does arouse the curiosity-arousing potential of stimuli, when curiosity is measured in terms of time spent in investigation or number of questions asked. Berlyne and Lawrence (1964) found that adult subjects chose to spend significantly longer looking at tachistoscopically presented geometrical figures having high values of complexity and incongruity than at figures having correspondingly low values. Berlyne and Frommer (1966) presented children aged from five to eleven with orally related stories, pictures, stories with pictures, and magic tricks at differing values of novelty, surprisingness and incongruity, and invited them to ask questions after each item: the number of questions asked was found to be greater for higher values of these variables.

The present experiment was designed to test the effect of incongruity on curiosity in fourteen and fifteen year old boys, the stimuli consisting of drawings depicting odd or unusual objects and situations, and curiosity being measured in terms of length of inspection-time and numbers of questions. Two possible sources of subject differences in curiosity were also examined, namely tested non-verbal intelligence and social class. We also intended to test a hypothesis derived from Bernstein's (1970) theory concerning the social origins of 'elaborated' and 'restricted' linguistic codes of language use, associated with the middle class and lower working class respectively. Bernstein postulates that MC families tend to be of the 'person-oriented' type, that is to say, the status of each member is not rigidly ascribed at the outset, but depends on his individual qualities rather than on his formal ascribed status, while LWC families tend to be of the 'positional' type, where roles are rigidly ascribed on the basis of the individual's formal sociological status, *e.g.* age, sex, position in family, *etc.*, and each member has little opportunity to behave in any way which is not recognised as being appropriate to his status in the family. This suggests that MC families foster a less regid attitude as to what constitutes 'normal' and 'abnormal' behaviour, and it may be hypothesised that MC boys would be more likely to take incongruity in their stride, particularly if the incongruity involves apparently role-inappropriate behaviour, as did two-thirds of the drawings used in the present experiment. To test this hypothesis, subjects were invited to offer explanations of the incongruous features of the drawings; it would be predicted that the MC subjects would tend to construe the incongruities as being explicable in 'normal' terms. If we were concerned

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about inspection times however, we might expect WC boys to look longer than MC boys at incongruous pictures, since they should have greater difficulty accommodating them.

In addition, from a study of the curiosity of ten and eleven year old children using pictures of museum objects as stimuli, Ashton (1965) proposed that offering up hypotheses about the nature of the stimuli is an index of curiosity, on the assumption that a curious person will attempt to provide answers to his own questions when information is not forthcoming. It was therefore decided to examine the relationship between offering explanations and the two measures of curiosity used.

3.2.2. Method

Materials. Two complementary sets of freehand drawings, measuring 14 inches x 10 inches and mounted on cardboard, one set ('experimental') depicting one of three sorts of incongruity, 'role-reversal', 'role-emotion conflict' or 'conjunction of inappropriate attributes', the other set ('control') depicting the corresponding 'normal' situation or object. The drawings showed:

	Experimental	Control
Role-reversal		
1.	Schoolroom: teacher in desk; child at front.	**Reverse**
2.	Street: thief chasing policeman.	**Reverse**
3.	Street: woman with dog in pram; child on lead.	**Reverse**
4.	Girl handing boy bunch of flowers.	**Reverse**
5.	Mother playing with toys; child cooking.	**Reverse**
6.	Father sewing; mother sawing.	**Reverse**
Role emotion conflict		
7.	Girl chasing mouse; boy frightened on chair.	**Reverse**
8.	Crying policeman.	**Not crying**
9.	Nurse maltreating patient.	**Kindly nurse**
10.	Race; winner frowning, loser smiling.	**Reverse**
11.	Angry vicar raging at child.	**Kindly vicar**
12.	Wall being demolished; man underneath unconcerned.	**Man concerned**
Conjunction of inappropriate attributes		
13.	Green pillar-box.	**Red pillar-box**
14.	Bearded woman.	**Bearded man**
15.	Giant spider with man.	**Normal-size spider**
16.	Soldier firing bent gun.	**Straight gun**
17.	Car in sea.	**Car on land**
18.	Cricketer, with oversize stumps.	**Normal-sized stumps**

Subjects.

Twenty four fourth form boys were used as subjects. They were divided into three social-class groups on the basis of father's position on the Hall-Jones Scale of

Occupational Prestige (1950). The MC group were selected from a different school from the two WC groups. To control for the effects of intelligence test scores, each subject was matched with one in each of the other groups on the basis of scores on Raven's Standard Progressive Matrices (Sets A-E), which were administered shortly before the experiment was carried out. Since the MC group were tested at an earlier stage in the school year than the other two groups, their ages were substantially lower.

Table 3.2.1. Characteristics of Experimental Subjects

Social Class	Middle	Upper Working	Lower Working
Mean Hall-Jones Grade	3.37	(All 5b)	6.75
Median Age	14/7	15/4	15/5
Range	14.5-15.5	14.11-15.9	14.9-15.9
Mean Raven's Score	47.75	47.75	48,12
sd	3.39	4.17	3.90
N	8	8	8

Sequence of pictures. All subjects were shown half each of the experimental and control pictures, there being two fixed presentation sequences, A and B, half the subjects in each group being assigned to one sequence, and half to the other. These were:

A	12E	16C	10C	15E	2C	13E	3E	1E	7C	6C	5E	8C	14C	9E	18C	11E	4C	17E
B	12C	16E	10E	15C	2E	13C	3C	1C	7E	6E	5C	8E	14E	9C	18E	11C	4E	17C

E = Experimental C = Control

Procedure. Each subject was seen individually. At the start of the experiment, the pictures lay face down on a table in front of the subject, who was told:

> 'You have there a set of 18 pictures, which we'll be going through three times. On the first run through I just want you to get some idea what they are like, and I won't be asking any questions about them. Just go through them in your own time, taking as long or as little time as you like. Any questions?

The time spent looking at each picture was recorded. After the first run was completed, the following instructions were given:

> 'Now I'll show you the pictures one at a time and ask you something about each one. You may have noticed that some of the pictures have odd or unusual events or objects in them, and some don't. I want you to tell me about anything which you think is obviously odd or unusual.'

As each picture was presented, the subject was asked:

> 'Now, is there anything odd going on in this picture?'

Then, after it was certain that he had no more to say:

> 'Right, now I'd like to know if you have any questions about what's (going on) in the picture. You may have some and you may not; it doesn't matter. Have you any?'

Before the third run, the subject was told:

> 'Lastly, I'd like to know if you can suggest some explanations of some things in these pictures. I'll tell you what I want explained, and we'll see if you can think of some reasons for these things'.

The subject was then asked to explain the incongruous feature in each of the experimental pictures, *viz.:*

Sequence A

12. Why is the man happy when the wall is falling on top of him and will hurt him?
15. Why is the spider so big?
13. Why is the pillar-box green?
3. Why is the dog in the pram and the baby on the lead?
1. Why is the boy teaching and the teacher learning?
5. Why is the boy cooking and the mother playing with the toys?
9. Why is the nurse being cruel?
11. Why is the vicar angrey?
17. Why is the car in the sea?

Sequence B

16. Why is the soldier firing a bent gun?
10. Why is the winner unhappy and the loser happy?
2. Why is the burglar chasing the policeman?
7. Why is the boy scared, and the girl chasing the mouse?
6. Why is the woman sawing and the man sewing?
8. Why is the policeman crying?
14. Why has the woman got a beard?
13. Why are the stumps so large?
4. Why is the girl giving the boy the flowers?

The second and third runs were both tape recorded.

3.2.3. Results

1. *Inspection times.* Although there were no significant differences between the uncombined groups in the total time spent looking at all eighteen pictures (Table 3.2) (F = 3.07, df = 2/21, p insig.), and a Hartley test showed no significant difference between the variances of the scores of the MC and LWC groups (F max (3.7) = 4.70), the combined WC did tend to look longer than MC group (U = 37, z = 1.65, p = .0495).

Table 3.2.2. Inspection Time as a function of Social Class

		Social Class		
		Middle	Upper Working	Lower Working
Looking Time	$\bar{X}$	710	873	1026
	sd	44.84	41.90	90.86

There were no significant differences for any of the groups between the total time spent looking at the experimental and control pictures (Table 3.3.), and again a Hartley test showed no significant difference between the variances of the difference scores of the MC and LWC groups (F max (3, 7) = 4.74). Inspection of the data revealed no significant effects of Raven's scores either on total or on experimental/control differential inspection times.

Table 3.2.3. Inspection times for Incongruous and Congruous Pictures

	Mean Looking Time (secs)					
Social Class	Experimental	Control	sd	t	df	p
Middle	44.87	43.87	10.18	0.27	7	–
Upper Working	52.12	57.00	11.82	1.16	7	–
Lower Working	62.00	66.75	22.18	0.60	7	–

2. *Number of questions asked.* (a) Over all subjects, the experimental pictures elicited on average 1.33 questions and the control pictures 0.37. This difference of 0.95 is significant ($t = 2.78$, df/23, $p < .02$) (b) There were no significant social class differences in the number of questions elicited by the experimental pictures (MC = 1.62, UWC = 1.37, LWC = 1.12). The picture-sequence used (A or B) also had no significant effect. (c) Over all subjects, the product-moment correlation between Raven's scores and number of questions elicited by the incongruous pictures was −0.46 ($N = 24$, $p < 0.05$).

3. *Explanations.* The explanations of the incongruous features of the pictures offered in the third run were categorised as follows:

(i) *No response,* or 'Don't know'.

(ii) *An inadequate explanation, i.e.* one which denies implicitly that there is anything to be explained, or else fails to account satisfactorily or plausibly for the peculiarity, e.g. Picture 4E: 'Just to bring over the fact that it's a spider, and contrast it with the man'. 17E: 'Perhaps the policeman has stolen what the burglar has already stole'. 1E: 'Because the cricketer's so small, I expect'. 6E: 'Because they had no red paint left'.

(iii) *An explanation which recognises the existence of oddity,* and tries to explain it in those terms: while implicitly admitting that the picture shows something abnormal, the subject is still able to offer some reason for its abnormality, *e.g.* 4E: 'It (the spider) could be a monster from somewhere else'. 16E: 'Perhaps she cares for the dog more than for the baby'. 5E: 'Perhaps it's a false beard'. 7E: 'He wants to be killed ... fed up with life'.

(iv) *An explanation which denies the existence of oddity,* and explains the incongruity in 'normal' as well as plausible terms, *e.g.* 2E: 'It could be an amphibious car'; 11E: 'Someone could have died in his (the policeman's) family'; 6E: 'It (the pillar-box) may be in another country . . . France or Switzerland'; 18E: 'The teacher told the boy off for talking too much, and said 'You take this lesson', and put him up there'.

MC boys were more likely than WC boys to use Type D explanations ($U = 24$, $z = 2.53$, $p = .0057$) ($\bar{X}MC = 2.75$; $\bar{X}WC = 1.38$) and conversely avoided the others. Of the other responses Type C were the most common and WC boys tended to give more of these than MC boys ($U = 40$, $z = 1.49$, $p = .0681$) ($\bar{X}MC = 2.87$, $\bar{X}WC = 4.25$).

Over all subjects, there was a product-moment correlation of −0.46 between Raven's scores and number of Type 'A' ('no explanation') responses given.

4. *Relationships between the dependent variables.* Inspection of the data revealed no clear relationship between the total time spent looking at the experimental pictures and the number of questions asked about them, nor between the time spent looking at each picture and its probability of eliciting a question. Likewise, no clear relationships appeared between the number of questions asked and the frequency of any of the four types of explanation.

3.2.4 Discussion

The results confirm the hypothesis derived from Berlyne's theory that incongruity stimulates curiosity, at least when curiosity is measured in terms of question-asking. However, while the experimental pictures did elicit twice as many questions as the controls, the absolute number of questions was very small — the twenty four subjects produced a total of only forty two. Contrary to the findings of Berlyne and Lawrence, incongruity had no significant effect on inspection time; for none of the groups was there a significant difference between the times spent looking at the two sets of drawings. We shall return to these points later.

There was weak evidence for an effect of social class on measures of curiosity; with the WC boys looking longer. Intelligence test scores were not found to affect inspection-time, but did appear to have some negative relationship to the number of questions. These results are apparently contrary to those of Ashton, who found that inspection-time was the only measure of curiosity to be correlated with intelligence. For explanations the MC group provided more oddity-denying responses than the WC groups. This lends support to the Bernstein hypothesis. There was some tendency for more intelligent subjects to offer a greater number of explanations.

It would appear from the small number of questions asked, either that the subjects were low in curiosity (assuming Berlyne's theory to be true), or else that the particular stimuli used were somehow not adequate to elicit it, perhaps not being sufficiently interesting to the subjects. There are some grounds for accepting this latter hypothesis, if only rather tentatively.

The failure to find any difference in inspection time between the normal and incongruous pictures: Day (1966) found that both the time spent looking at a set of pictures and designs and judgements of 'interestingness' were distributed as the same inverted U-function of complexity, which suggests that stimuli may be looked at for as long as they are interesting. If this is correct then it appears that the incongruous pictures were found no more interesting for the subjects than the normal ones. Since the subjects were adolescents and the drawings were essentially cartoons with a solitary odd feature, we were perhaps over-optimistic about the efficacy of our materials.

The negative relationship between intelligence test scores and number of questions asked suggests the possibility that the stimuli used may be more appropriate for eliciting curiosity in less cognitively mature subjects. Berlyne and Frommer found that the incidence of questions to their stimuli rose between five and eight years but declined between eight and eleven years. One explanation of this may be that the level of curiosity rises to a peak at around eight years and thereafter

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declines, but it seems more likely that the particular stimuli used were maximally surprising for the intermediate age group; for the youngest children, they were too remote from existing cognitive structures to hold much interest, while for the eldest, they were already largely assimilated into their cognitive structures. Regarding the present experiment, the more specific point can be made that adolescents will be so used to comics, cartoons *etc.*, involving incongruous drawings that they (and particularly the brighter ones) will come to accept them as 'normal'; while they would regard a real green pillar-box as being rather curious, a drawing of one would be quite acceptable. Possibly, more realistic stimuli, such as photographs of the same objects and situations, would have provoked a greater differential response.

That the MC subjects could offer 'normal' explanations for incongruities implies that they may have had less grounds than WC boys for being curious and their shorter looking times are consistent with such a view, but the paucity of questions across all groups would make further discussion too speculative. It is not surprising that less intelligent subjects tended to be less adept at providing explanations.

Given the validity of some of our masochistic criticism, the obvious course of action was to check whether or not less intellectual mature children would have asked more questions and to obtain photographs rather than the cartoon drawings used here. While both would have been easy to manage in theory, and the latter easy in practice, the difficulties of obtaining satisfactory comparison groups discouraged us from this pursuit.

That we were able to obtain some results (experimental pictures evoking not quite so few questions as controls, MC boys offering most explanations ignoring incongruity, Raven's scores correlating with numbers of questions to experimental pictures) suggests that the enterprise may be grounded on reasonable assumptions and that improvements in design would yield dividends. Dropping the age of the subjects for social class comparisons and substituting photographs for drawings would probably be sufficient.

3.3 Study II. Questioning in a Structured Situation as related to Age, Ability and Expressed Interest

3.3.1 Introduction

The purpose of this series of studies is to examine epistemic behaviour in secondary school children, and in particular their question asking, from the point of view of the discrepancy hypothesis outlined in chapter 2. Verbal material, namely, brief descriptions of some well-known psychology experiments, were to be used to elicit subjects' curiosity. Although the problem of operationalising 'amount of discrepancy' is likely to be at least as great as it is with respect to exploratory behaviour, the evidence reviewed in chapter 2 and the results of Study I (section 3.2) did not indicate that patterns of questioning do vary systematically with cognitive maturity in both 'real-life' and experimental situations.

Accordingly, the experiment described here is mainly an exploratory one, aimed at discovering how the incidence and type of questions asked about the materials are related to age and intelligence in a sample of secondary school children. If, as argued, patterns of questioning are a function of discrepancy, then it is impossible to predict what these relationships will be. If it should be the case that older and brighter subjects manifest less curiosity, this could be explicable in terms of the material being more readily assimilable for them – subjects may not request information which they are capable of generating for themselves. To check for this possibility, subjects were given an opportunity to offer their own explanations for the outcomes of the experiments, although Ashton found that children who asked more questions about her museum objects also tended to suggest more hypotheses as to their identity; in other words, the more answers they requested, the more willing or able they were to try to provide their own.

In order to make the situation as natural and realistic as possible for the subjects, answers to their questions were both promised and provided. This should also be expected to encourage questioning, though it is worth noting that Berlyne and Frommer, in both their pilot and main studies, found that the immediate provision of answers increased the frequency of questions only for their intermediate age group. Also, to determine whether the numbers of questions asked about the individual experiments are a valid reflection of their relative curiosity-arousing potential, subjects were asked to rate their degree of interest in each one on a five point scale.

3.3.2 Method

Materials (See Appendix I). Each subject was provided with a booklet of eight quarto pages, each containing a description of a psychological experiment. These were based on accounts found in introductory text-books; they were made as simple as possible, and it was considered that the experiments selected would be fairly interesting for someone meeting them for the first time. Two of those given in the appendix (Experiments 4 and 7) were not used after it was found that many of the subjects used in a trial run were familiar with them already. Following each of the descriptions was a five point 'interestingness' scale (very interesting, quite interesting, only slightly interesting, dull, very dull), and spaces for subjects to write questions and explanations.

Subjects. The sample used consisted of forty eight boys from the first and fourth forms of a neighbourhood comprehensive school. These were taken from a larger sample comprising the whole of these forms, and were selected from the first, third and fourth streams in the case of the first form, and from the first and third streams in the case of the fourth form, thus permitting comparisons along the two dimensions of age and ability. The four groups resulting will be referred to as IV High, IV Low, I High and I Low.

The median ages of the subjects were as follows:–
First form : 12 years 3½ months (Range: 11, 11 – 12, 10)
Fourth form : 15 years 0½ months (Range: 14, 8 – 15, 9)

Procedure. The two years were seen separately, but en masse. After introductions, the boys were provided with the experimental materials and told:

> 'We in the psychology department at the University would like to find out how interesting people of your age might find psychology, and what questions you might like to ask about it. In the booklets on your desks, you'll find descriptions of eight experiments which have been done by different psychologists. Some of the experiments were done fifty or sixty years ago, but most of them were done much more recently. Some of them have been done with animals, and some with human subjects.'

After it had been ascertained that the boys knew the meaning of 'psychology', 'experiment' and 'subject', they were given these instructions:

> 'What I'd like you to do is this. I'd like you to read about each experiment, and then tick off how interesting or dull you find it. Then I'd like you to write down any questions about the experiment which you would like me

> to answer for you. Write as many or as few questions as you like, but I'll try to answer them all as soon as possible. Any questions before we begin?'

When all the subjects had finished writing their questions, they were instructed as follows:

> 'Lastly, I'd like to see if you can think of reasons why the experiments turned out as they did. If you can guess at an explanation, write it down in a few words at the bottom of each page. It doesn't matter if you can't think of any reason at all. Any questions?'

Questions were answered separately for each stream about a week after the experiment.

3.3.3 Results

Interest ratings. The mean ratings assigned to each experiment by each of the four groups are shown in Table 3.3.1. Over all groups, there was significant agreement among subjects in the ratings assigned to the experiments, the overall value of Spearman's W (Siegel, 1955, chapter 9) being .25 ($p < .001$). The values for each of the groups were .23 ($p < .01$), .33 ($p < .001$), .24 ($p < .001$) and .36 ($p < .001$) for IV High, I High, IV Low and I Low, respectively. (For the purposes of this test, ratings were converted to rankings.)

Table 3.3.1 Mean Interest Ratings per Experiment (Maximum = 5)
Age and Stream

Experiment	IV High	I High	IV Low	I Low	All Groups
1	3.17	3.17	3.42	3.08	3.21
2	4.58	4.67	4.00	3.83	4.27
3	3.83	4.00	3.75	3.67	3.81
5	3.67	3.50	3.83	3.67	3.67
6	4.67	4.67	4.58	4.50	4.60
8	4.17	4.33	3.58	3.83	3.98
9	4.33	4.25	4.08	4.17	4.21
10	3.50	4.17	3.50	3.50	3.67

There were no significant differences among the four groups in the mean total interest ratings for all the experiments. (Tables 3.32 and 3.3.3).

Table 3.3.2 Mean Total Interest Ratings Age and Stream
(all experiments)

	IV High	I High	IV Low	I Low
Mean	30.75	31.91	30.41	32.92
sd	4.16	3.92	3.85	4.72

Table 3.3.3 Analysis of Variance of Interest Ratings by Subject Groups

Source of Variance	Sum of Squares	df	Mean Square	F	p
Total	822.00	47			
Groups	46.99	3	15.66	< 1	–
Error	775.01	44	17.61		

Questions. Analysis of variance (Table 3.3.5) revealed significant differences among the groups in the mean numbers of questions asked and among the eight experiments in the mean numbers of questions which they elicited (Table 3.3.4). Duncan's multiple range tests (Dayton, 1970, Chap. 2) showed the mean of Group IV High to be significantly higher than those of I High ($p < .005$), IV Low and I Low ($p < .001$). No other differences between groups attained significance. The same test showed that Experiment 6, the most 'popular', elicited significantly more questions than Experiment 9, the second most popular ($p < .001$), which in turn elicited significantly more than Experiment 10, which was seventh in popularity.

Table 3.3.4 Mean Numbers of Questions Asked per Group and Experiment. Age and Stream

Group	IV High	I High	IV Low	I Low	All Groups	All Groups sd.
Experiment						
1	2.08	1.25	0.83	0.58	1.18	1.23
2	2.67	1.08	0.92	0.92	1.39	1.32
3	2.17	1.00	0.83	0.92	1.22	1.07
5	1.83	0.92	0.33	0.75	0.92	0.89
6	4.00	2.75	1.33	1.92	2.50	2.12
8	2.25	1.00	0.83	0.75	1.20	1.14
9	2.50	1.75	1.25	0.75	1.56	1.33
10	2.00	1.42	0.83	0.33	1.14	1.41
$\bar{X}$	19.50	11.16	7.16	6.91		
All Experiments sd	11.74	6.67	5.46	3.42		

Numbers of questions and interest ratings

The means of these, pooled over all groups, were found to correlate significantly. ($r = 0.64$; $p < .05$).

Table 3.3.5 Analysis of Variance of Questions per Subject Groups and Experiments. (Data used are square root transformations of raw scores)

Source of Variance	Sum of Squares	df	Mean Square	F	p
Between Ss	77.75	47			
Groups	36.44	3	12.14	13.03	< .001
Error	41.31	44	0.93		
Within Ss	104.78	336			
Experiments	20.42	7	2.91	8.08	< .001
Interaction	4.99	21	0.23	< 1	–
Error	79.37	308	0.25		

Question categories. (The classificatory system for questions is described in Appendix II). The mean numbers and percentages of questions falling into each of the sixteen categories are shown in Tables 3.3.6 and 3.3.7, respectively. Because of the low incidence of questions in most of the categories, only the numbers and proportions of closed questions and of open explanation questions were selected for analysis.

Closed questions

The mean numbers and percentages of closed (Yes – No) questions asked by each of the groups are shown in Table 3.3.8 and 3.3.10 respectively. Analyses of variance (Tables 3.3.9 and 3.3.11) showed the differences among the groups to be significant, Group IV High asking the greatest number and highest proportion, followed by Groups I High, IV Low and I Low in that order on both variables.

Table 3.3.8 Mean Numbers of Closed (Yes – No) Questions Age and Stream

	IV High	I High	IV Low	I Low
Mean	10.83	4.83	1.83	1.17
sd	4.57	5.15	1.64	1.33

Table 3.3.9 Analysis of Variance of Closed Questions by Subject Group

Source of Variance	Sum of Squares	df	Mean Square	F	p
Total	1270.67	47			
Groups	699.99	3	283.33	17.98	< .001
Error	570.68	44	12.97		

Table 3.3.6 Mean Numbers of Questions Asked per Category

Form of Question	Open					Closed					Both				
Group	IV	I	IV	I	All	IV	I	IV	I	All	IV	I	IV	I	All
Category	High	High	Low	Low	Groups	High	High	Low	Low	Groups	High	High	Low	Low	Groups
Explanation	2.58	2.16	2.50	3.50	2.68	2.75	0.91	0.25	0.17	1.02	5.33	3.08	2.75	3.67	3.70
Purpose	1.00	0.41	1.33	0.17	0.72	0.91	0.17	0.08	0.08	0.31	1.91	0.58	1.41	0.25	1.04
Justification	1.50	0.50	0.67	0.58	0.81	0.50	0.08	–	–	0.14	2.00	0.58	0.67	0.58	0.95
Details	2.00	2.17	0.67	1.25	1.52	1.83	0.91	0.41	0.42	0.89	3.83	3.08	1.08	1.67	2.41
Consequences	0.17	0.25	0.08	0.08	0.14	1.33	1.08	0.58	0.25	0.81	1.50	1.33	0.67	0.33	0.95
Manipulation	1.17	0.50	0.08	0.08	0.45	1.58	0.58	0.17	0.08	0.60	2.75	1.08	0.25	0.08	1.06
Generality	0.25	0.17	0.08	0.08	0.14	1.50	0.33	0.33	–	0.54	1.75	0.50	0.42	0.08	0.68
Surprise	–	0.17	–	–	0.04	0.42	0.75	0.08	0.08	0.37	0.42	0.91	0.08	0.08	0.41
All Categories	8.67	6.33	5.33	5.75	6.25	10.83	4.83	1.83	1.17	4.64	19.50	11.16	7.16	6.91	11.20

Table 3.3.7 Mean Percentages of Questions Asked per Category

Form of Question	Open					Closed					Both				
Group	IV	I	IV	I	All	IV	I	IV	I	All	IV	I	IV	I	All
Category	High	High	Low	Low	Groups	High	High	Low	Low	Groups	High	High	Low	Low	Groups
Explanation	13.67	20.75	39.25	45.50	29.79	15.33	11.42	4.28	2.25	8.27	29.08	32.17	43.42	47.75	38.08
Purpose	4.91	5.42	12.08	2.33	6.18	4.67	2.58	0.91	1.42	2.39	9.58	8.00	13.00	3.75	8.58
Justification	7.17	5.08	5.25	12.17	7.41	2.50	0.83	–	–	0.83	9.67	5.92	5.25	12.17	8.25
Details	9.75	14.42	9.00	18.83	13.00	8.92	8.25	5.50	5.00	6.91	18.67	22.67	14.88	28.82	19.93
Consequences	0.58	1.17	9.83	0.58	0.79	8.33	8.75	15.00	5.00	9.27	9.00	10.00	15.83	5.58	10.10
Manipulation	4.92	3.67	0.83	2.75	13.04	8.67	5.92	1.67	0.83	4.27	13.50	9.58	2.50	3.58	7.29
Generality	1.00	0.75	0.42	2.75	1.22	6.83	3.17	4.67	–	3.66	7.75	3.91	5.08	2.75	4.87
Surprise	–	1.33	–	–	0.33	2.91	6.42	2.08	0.58	3.00	2.91	7.75	2.08	0.58	3.33
All Categories	42.00	52.58	66.83	85.00	61.60	58.00	47.47	33.16	15.00	38.40	100.00	100.00	100.00	100.00	100.00

Table 3.3.10 Mean Percentages of Closed Questions
Age and Stream

	IV High	I High	IV Low	I Low
Mean	58.00	47.71	33.16	15.00
sd	11.84	37.26	27.45	15.71

Table 3.3.11 Analysis of Variance of Percentages of Closed
Questions by Subject Groups

Source	SS	df	MS	F	p
Total	35105.48	47			
Groups	12484.89	3	4161.63	8.09	< .001
Error	22620.59	44	514.10		

Open explanation questions

While there were no significant differences in the mean numbers of these questions asked (Tables 3.3.12 and 3.3.13), there were in the mean percentages, Group I Low asking the highest proportion, followed by IV Low, I High and IV High (Tables 3.3.14 and 3.3.15).

Table 3.3.12 Mean Numbers of Open Explanation-Seeking
Questions by Subject Groups

	IV High	I High	IV Low	I Low
Mean	2.58	2.16	2.50	3.50
sd	1.60	2.64	1.58	3.58

Table 3.3.13 Analysis of Variance of Open Explanation-
Seeking Questions by Subject Groups

Source of Variance	Sum of Square	df	Mean Square	F	p
Total	43.43	47			
Groups	0.57	3	0.29	< 1	
Error	84.70	44	1.92		

Table 3.3.14 Mean Percentages of Open Explanation-
Seeking Questions by Subject Groups. Age and
Stream

	IV High	I High	IV Low	I Low
Mean	13.83	20.75	39.25	45.50
sd	14.43	23.61	27.67	35.43

Table 3.3.15 Analysis of Variance of Percentages of Open Explanation-Seeking Questions by Subject Groups

Source of Variance	Sum of Squares	df	Mean Square	F	p
Total	451.53	47			
Groups	87.10	3	29.03	3.50	$< .025$
Error	343.43	44	8.28		

Explanations. Table 3.3.16 shows the mean number of explanations offered by each of the groups. Since these were not amenable to parametric analysis, high-low comparisons among groups were carried out by means of X^2 tests. These comparisons were between the numbers of subjects in each group offering five or more, and less than five, explanations. In order to meet the minimal cell frequency requirements for the tests, scores for the two equal age groups and for the two comparable ability groups were combined (Tables 3.3.17(a) and 3.3.17(b)). For the between-streams comparison, the values of X^2 obtained were 20.49 when numbers of closed explanation questions were excluded, and 25.17 when these were included ($df = 1$, $p < .001$ in each case). For the between age group comparison, the values were less than one and non-significant.

Table 3.3.16 Mean Numbers of Explanations Offered by Groups of Subjects (Max. = 8)

	Age and Stream			
	IV High	I High	IV Low	I Low
Mean	5.66	5.25	2.41	2.25
	(5.83)*	(5.91)	(2.41)	(2.41)

*Including explanations apparent in 'closed' questions.

Table 3.3.17 (a) and (b). Number of Subjects offering Many (5+) — and Few (4–) Explanations

		(a) Age Comparison		(b) Stream Comparison	
		IV High IV Low	I High I Low	IV High I Low	IV Low I Low
Explanations	Many (5+)	8 (10)	9 (9)	16 (18)	1 (1)
	Few (4–)	16 (14)	15 (15)	8 (6)	23 (23)

*Including explanations apparent in 'closed' questions.

(In a number of cases, subjects did not write explanations apparently because they had already suggested them in closed explanation questions – Was it because . . . ? Figures in brackets in the preceding tables are based on numbers of explanations combined with numbers of questions of this sort asked).

3.3.4. Discussion

Although it would appear from the results that the experimental procedure has been effective in arousing the curiosity of the subjects, one must be cautious in making this interpretation; schoolchildren seem to be oriented to perceiving any task which they are required to do in the classroom as an achievement test of some sort, and in the present case, the possibility exists that the data which we have are merely the result of the subjects writing down as many questions as they could think of. While it is impossible to discount this effect altogether, it does seem likely that the questions are asked are, at least to a great extent, genuine requests for information: it was emphasised to the boys that they were not being tested and that they should only ask questions that they really wanted to know the answers to, and again, there is no reason for supposing that the generally high interest ratings are not valid.

Regarding the questions asked, the results may be summarised as follows: the amount of questioning evoked by the descriptions was positively related to the two measures of intellectual maturity, and with the present sample, ability level was a better predictor of performance than age; that is to say, the high-stream fourth years were more similar to their first year counterparts than to the low-stream fourth years. The rank order for the four groups – IV High, I High, IV Low, I Low – was the same as for variables which one should expect to be related to intellectual maturity: as well as asking few questions overall, the younger and less intelligent subjects asked a very low proportion of closed questions, and were much more restricted in the type of information which they sought – nearly half the questions asked by the low-stream first years were of the type 'Why did the experiment turn out as it did?' In addition, they were able to offer relatively few explanations for the outcomes of the experiments.

These findings may be taken to indicate that the stimulus materials were closer to the optimal point of discrepancy for the more cognitively advanced subjects, while for the less advanced, they were too remote for a great degree of accommodation to be possible: particularly notable was the almost complete absence in the low ability groups of 'manipulation' and 'generality' questions, *i.e.* questions that 'go beyond' the information presented.

However, despite these differences in expressed curiosity, all groups professed an equal degree of interest in the materials. This suggests that discrepancy as defined here may have a cognitive rather than a motivational influence of questioning, a possibility that requires further investigation. Also, the findings that subjects were reliably consistent in their interest judgements and that these judgements predicted amount of questioning imply that they were tending to 'channel' their curiosity on the basis of the same criteria. A second task is to discover what these criteria are.

3.4. Study III. Curiosity in relation to Assimilability, Surprise and Perceived Relevance

3.4.1 Introduction

The relationship found between patterns of question-asking and intellectual maturity in the second study was taken as indirect evidence for the hypothesis that the expression of curiosity is dependent on the individual's capacity to relate new material to the concepts which he already possesses. However, while this can account for the differences between the groups, it appeared that the way in which subjects distribute their questions among the various experiments may be determined by other factors. Two suggestions may be made as to what these factors are likely to be.

The first of these is the degree to which the information in the materials violates the subject's expectancies, or comes into direct conflict with his existing ideas. This is the 'sudden clash, gap or disparity' that Isaacs referred to, and that previous evidence has shown to be a particularly potent instigator of epistemic curiosity, whether generated by 'improbable' questions (Berlyne, 1954b), pictures with conflicting information (Ashton), magic tricks (Berlyne and Frommer), or incongruous drawings (Duffy and Robinson). It can be regarded as a form of discrepancy qualitatively different from that described in the previous chapter.

The second factor that may be suggested is the 'relevance' of the material to the subject, or in other words, the extent to which he thinks that information about it is worth having. Berlyne (1960, chapter 11) makes a distinction between 'intrinsic' and 'extrinsic' epistemic curiosity: knowledge may be sought as an end in itself, or for the sake of some external reward that is contingent upon it. Nevertheless, even if the resolution of conceptual conflict is a sufficient incentive for knowledge-seeking, it is reasonable to suppose that a person will be more likely to ask questions if he feels a need for information on some other grounds. An attempt to enhance such a need in an educational setting, without recourse to any direct rewards, was made by Hovey, Gruber and Terrell (1963): two university classes in educational psychology were subjected to two different teaching methods; one class was taught exclusively by lectures (three per week) while a 'self-directed study' (SDS) technique, involving small group discussion and only one lecture per week, was applied to the other. It was assumed that this latter condition would enhance students' active involvement in course material and thereby their views of its relevance to themselves. A pencil-and-paper 'curiosity test' given ten months after the start of the course comprised three groups of five items, relating to 'question-raising behaviour', 'interest in educational psychology', and 'desire to get more information about educational psychology'. The SDS class was found to be slightly superior on all five items in the first group, and on four out of five items in each of the second and third groups. At the same time, the two classes did not differ significantly in their retention of course material. How far these results can be generalised is open to doubt, however, especially since they could easily be attributable to a 'Hawthorne effect'.

The investigation to be reported here employs basically the same materials as the first one, and is designed to find out whether interest and questioning increase as a function of how surprising and how 'valuable' subjects find the experiments, and to test the prediction that the assimilability of the material will affect interest ratings and numbers of questions differentially. In the previous study, between-subject differences in the remoteness of the material were inferred from the intellectual level of the groups; in the present one, a direct measure is used, namely, the ability of subjects to comprehend the description.

3.4.2. Method

Materials. For each subject, there were two booklets containing the same eight descriptions of psychological experiments used in the previous study, except that Piaget's conservation of volume experiments was substituted for Perky's study of imagery, which was used as an instructional example.

The first booklet (see Appendix III) contained comprehension tests on each of the experiments, consisting of four questions, each with four multiple-choice answers, and three five-point rating scales regarding how surprising the outcome of the experiment was, how interesting it was, and how valuable it was to know about it. There was also space for subjects to write reasons for their judgements of 'interest' and 'value'. The second booklet contained spaces on each page to write questions about the experiments.

Subjects. The procedures were carried out with the first to sixth streams of the third year of a girls' comprehensive school. Since streaming was roughly on the basis of ability, the six streams may be considered as crudely representing a high-to-low intelligence continuum. For the purposes of analysis, subjects who had not completed both halves of the experiment or had not correctly followed instructions were omitted, leaving a final sample of 136. The numbers used from each stream were twenty-nine, twenty-eight, twenty-nine, fourteen, twenty-one and fifteen going from first to sixth. The median age of the subjects was 14.4, with a range of 13, 10 to 14,10.

Procedure. Each stream was seen separately on successive days, the comprehension test and ratings being completed on the first day, and the question form on the second. Both sessions lasted approximately 80 minutes. In the first, subjects were given a general introduction to the materials as before, after which they completed the example and went through the rest of the experiments in their own time. Instructions for the question writing task were the same as before; questions were answered about two weeks after the completion of the procedure, together with a demonstration of the Lee (delayed auditory feedback) effect.

3.4.3. Results

Differences between streams. Although numbers of questions varied significantly with stream (Tables 3.4.1 and 3.4.2), it can be seen that there was no obvious pattern: little difference appeared between streams one, three, four and five, which each asked considerably more than streams two and six. Frequency of comprehension errors did increase significantly with decreasing ability level (Tables 3.4.3. and 3.4.4.).

Table 3.4.1. Mean Numbers of Questions asked by Pupils in each Stream

	Stream					
	1	2	3	4	5	6
Mean number of questions	16.34	11.75	14.65	15.07	15.47	11.53
sd	8.25	4.82	10.42	8.43	11.80	7.18

Relationships among variables. In order to test for inter-relationships among the five dependent variables, the scores for the eight experiments were converted to rankings for each subject, and coefficients of concordance were computed for the combined

Table 3.4.2. Analysis of Variance of Questions by Streams

Source of Variance	Sum of Squares	df	Mean Square	F	P
Total	10787.00	135			
Streams	5583.54	5	1116.70	27.90	$< .001$
Error	5203.46	130	40.02		

Table 3.4.3. Mean Number of Comprehension Errors for Each Stream

	Stream					
	1	2	3	4	5	6
Mean No. of Errors	0.34	1.57	1.75	2.28	1.85	5.86
sd	0.56	2.05	1.71	1.98	1.20	1.58

Table 3.4.4. Analysis of Variance of Comprehension Errors by Streams

Source of Variance	Sum of Squares	df	Mean Square	F	P
Total	461.39	135			
Streams	101.74	5	20.34	7.36	$< .001$
Error	359.65	130	2.76		

sample. Where this statistic attained significance, it was considered justified to use the sample mean as the 'true' score for each experiment. (Siegel, *op. cit.*). The values of W are shown in Table 3.4.5. Although these were low, all were significant at the .001 level. Subjects tended to make few errors in the comprehension test, and not to use the lowest two categories in the ratings scales, which is likely to have militated against higher values.

Table 3.4.5. Coefficients of Concordance for Numbers of Questions, Comprehension Scores and Ratings

Variable	W
Number of Questions	.09
Comprehension Scores	.11
Ratings of Surprise	.22
Ratings of Interest	.13
Ratings of Value	.05

Table 3.4.6. shows the mean scores on each of the five variables for the eight experiments, and Table 3.4.7. the correlations among numbers of questions and ratings across the experiments. All were positive, and all except one obtained significance above the 0.05 level.

Table 3.4.6. Mean Numbers of Questions, Comprehension Scores and Ratings per Experiment

	Experiment							
	1	2	3	4	5	6	7	8
No. of questions	1.75	1.89	2.13	1.79	1.39	3.40	1.25	1.61
Comprehension score	3.72	3.97	3.95	3.85	3.51	3.82	3.69	3.73
Ratings of surprise	3.47	3.63	3.79	3.89	3.94	4.55	3.00	4.20
Ratings of interest	3.72	4.18	4.06	3.91	3.84	4.32	3.50	4.19
Ratings of Value	3.59	3.93	3.79	3.66	3.69	3.97	3.39	3.84

Table 3.4.7. Correlation Matrix : Mean Numbers of Questions and Ratings of Surprise, Interest and Value (N = 8)

	Surprise	Interest	Value
Questions	.616	.751*	.789*
Surprise	–	.835**	.722*
Interest	–	–	.942***

* p < .05 ** p < .01 *** p < .001

Tables 3.4.8a and b show the uncorrected and partial correlations between rated interest, comprehension scores and numbers of questions. With the variance common to interest and questions partialled out, as predicted, no correlation appears between interest and comprehension, but at the same time, the positive correlation between questions and comprehension fails to attain significance.

Table 3.4.8a Uncorrected Correlations between Interest, Comprehension Questions (N = 8)

	Interest	Comprehension
Comprehension	.506	–
Questions	.751	.682

Table 3.4.8b. Partial Correlations between Interest, Comprehension and Questions (N = 8)

	Interest	Comprehension
Comprehension	.011	
Questions	.643	.530

3.4.4. Discussion

The failure to find a positive relationship between ability level and incidence of questions, despite the fact that the former was related to comprehension of the materials, is at variance with the results of the first study, and suggests that the disposition of the subjects to write questions may have been affected by situational factors such as the social atmosphere prevailing in the classroom. However, as no specific variables can be pointed to which are likely to have raised or depressed the amount of questioning, this must remain purely speculative.

Nonetheless, the picture emerging from the intercorrelations among questions and the three rating scales is a reasonably clear one, though the possibility exists that the positive correlations between the scales were in part a function of carry-over effects, and would not have been so high had the subjects not been required to complete them consecutively. Both surprise and value significantly predicted interest ratings and were more strongly related to interest than to each other. Interest significantly predicted numbers of questions.

Bearing in mind that these relationships may have been considerably different had different sets or types of stimulus materials been used, these findings can be interpreted as being consistent with the notion that the unpredictability and perceived relevance of new information influence its potential to provoke curiosity. This conclusion is reinforced by the reasons that subjects gave for their judgements of interest and value. Nearly half (forty five per cent) of the reasons given for high ratings of interest referred to the unexpected nature of the experimental results, while almost all low ratings (eighty five per cent) were justified in terms of their predictability; the reasons most frequently given for high value ratings referred to general principles that could be derived from the experiments (thirty four per cent) or to possible practical applications of their findings (thirty per cent).

Although reasons of unexpectedness were rarely given for judgements of value, and though there seems to be no logical relationship between whether information is unexpected and whether it is worth having on extrinsic grounds, the positive correlation between surprise and value suggests that these are related psychologically. If this correlation is not attributable entirely to a carry-over effect, the most probable explanation is that subjects were not judging value merely in terms of how valuable it was to know about a given experiment, but rather in terms of how valuable it was to find out about it. In other words, at least a minimal level of unpredictability is prerequisite for information to be perceived as relevant.

There was some support for the hypothesis that the assimilability of material is related in a cognitive rather than a motivational way to questioning; despite the fact that the comprehension test proved to be very insensitive instrument, in that very few errors were made on it at all, scores were more closely correlated with numbers of questions than with expressed interest; although the evidence from this study is not very clear, it may tentatively suggest that 'cognitive discrepancy' has a limiting effect on the ability to express curiosity rather than a determining effect on the desire to do so.

In summary, then, it may be concluded that while conflict resulting from a violation of expectancies may be a sufficient condition for curiosity arousal, neither a moderate disparity from previous knowledge nor perceived extrinsic relevance are. It should be noted, however, that some ability on the individual's part to relate new material to his existing concepts is a necessary condition for it both to generate conflict and to be seen as having value.

The levels of interest expressed in, and comprehension of, the experiments have been interpreted on the basis of the present findings as indicating, respectively, subjects' willingness and ability to seek and acquire more information about them. So far, the concern has been with the accommodatory phase of information seeking; the relation of these cognitive and motivational factors to the actual acquisition, or assimilation, of the materials is considered in the next section.

3.5. Study IV. Questioning, Interest and Retention

3.5.1. Introduction

Berlyne's theory predicts, and empirical studies have demonstrated, that information which enables subjects to resolve previously-aroused conflict is retained particularly well, whether it does so by answering questions provided to the subjects (Berlyne, 1954b) or otherwise reducing uncertainty (Berlyne, 1966b; Nicki and Shea, 1971). However, in the studies by Paradowski (1967) and Pielstick and Woodruff (1968) also described in Section 2, subjects showed strongest recall for stimuli which were relatively strange or unfamiliar, *i.e.* those that were likely to induce rather than reduce conflict on Berlyne's theory.

If learning can be enhanced for information that elicits, as well as answers questions, then it should be expected that subjects' retention of the experimental materials will be positively related to the degree of curiosity that they arouse. It was found in the previous investigation that comprehension of the experiments tended to predict amount of questioning rather than judgements of interest. On the present hypothesis, it should be expected that if the multiple-choice questions employed to measure comprehension are used as a recognition task following exposure to the materials, the ability to answer them will be more closely related to interest, since this will now reflect motivational in addition to cognitive processes. Moreover, if this relationship is mediated by conflict, retention scores should also be related to ratings of surprise independently of value.

3.5.2 Method

Materials. Three sets of booklets were used. The 'ratings' booklet contained the same eight descriptions used in the previous study, each coupled with the three five-point scales for surprise, interest and value. The 'retention' booklet contained the first sentence of each description together with the multiple-choice questions used in the previous study to measure comprehension. The 'questions' booklet was the same as that used before.

Subjects. The sample consisted of the second and third streams of the third year of a boys' comprehensive school (N = 45). The median age of the sample was 13.1, with a range of 12.8 to 13.8.

Procedure. The experiment was carried out over two days. The sample was divided as nearly as possible into two equal groups, with twenty-two boys completing the ratings and retention tasks on the first day, and twenty-three writing questions on the second.

The procedure and instructions for the ratings task were basically the same as those used previously, except that the instructional example was omitted. When all the subjects had completed the ratings, the retention booklets were distributed, and the following instructions were given:

> 'Next I'd like to see how well you can remember the experiments. In these booklets, you'll find four questions about each experiment. I've given the first sentence of each description, just to remind you which experiment the questions are about. For each question underline what you think is the right answer. If you don't know the answer, just go on to the next question, though of course, it's often worthwhile to take a guess. Go through the questions fairly quickly; there's no need to take too much time over this. Remember, this isn't a test to see how bright you are; I'm not interested in seeing who can get the most answers right.'

In order to counteract any possible position effects on retention, half of the booklets commenced at experiment 1 and half at experiment 5 for both ratings and retention.

On the second day, the new group were given the question-writing task.

3.5.3. Results

Coefficients of concordance for all five dependent variables were significant at the .001 level, though again, their values were not very high (Table 3.5.1.).

Table 3.5.1. Coefficients of Concordance for Numbers of Questions, Retention Scores and Ratings

Variable	W
No. of questions	.19
Retention scores	.28
Ratings of surprise	.21
Ratings of interest	.27
Ratings of value	.17

The mean scores on these variables are shown in Table 3.5.2. As can be seen from Table 3.5.3b, retention scores correlated highly with interest ratings but negatively with numbers of questions after the variance common to both had been partialled out. They also correlated positively with both surprise and value, but these correlations dropped to a non-significant level when the common variance had been partialled out in each case (Tables 3.5.4a and b).

Table 3.5.2. Mean numbers of Questions Retention Scores and Rating per Experiment

	Experiment							
	1	2	3	4	5	6	7	8
No. of questions	0.52	1.00	0.69	0.56	0.73	1.47	0.43	0.43
Retention	2.68	3.27	3.86	3.31	2.63	3.54	2.36	3.13
Surprise	3.13	3.81	3.90	3.27	3.31	4.63	2.54	3.86
Interest	3.22	4.27	3.95	3.27	3.40	4.63	2.95	3.50
Value	2.86	3.50	3.68	3.22	3.13	4.04	2.95	2.95

Table 3.5.3a. Uncorrected Correlations between Interest, Questions and Retention (N = 8)

	Interest	Questions
Questions	.886**	–
Retention	.805*	.491

Table 3.5.3b. Partial Correlations between Interest, Questions and Retention (N = 8)

	Interest	Questions
Questions	.988***	–
Retention	.946**	–.808*

Table 3.5.4a Uncorrected Correlations between Surprise, Value and Retention (N = 8)

	Surprise	Value
Value	–.806*	–
Retention	.793*	.779*

Table 3.5.4b. Partial Correlations between Surprise, Value and Retention

	Surprise	Value
Value	.493	–
Retention	.445	.388

* $p < .05$ ** $p < .01$ *** $p < .001$

3.5.4. Discussion

The prediction that retention scores would increase as a function of expressed interest was strongly borne out by the results, though the relationship was not singly attributable to either surprise or value; the fact that each failed to show a significant effect when the other was held constant suggests that retention may have been dependent upon the two variables conjointly. Since it would also be expected to be facilitated by the initial assimilability of the materials, the negative relationship found between retention and numbers of questions with interest held constant is puzzling, and no obvious explanation suggests itself.

The findings are, however, generally in accord with those of Paradowski and Pielstick and Woodruff, and do not appear to be amenable to explanation in terms of reinforcement by conflict-reduction. The most likely interpretation may be that the more interesting experiments mobilised greater attention from the subjects; this is in line with Ausubel's suggestion quoted in chapter 1, and also with a hypothesis proposed by Rothkopf (1965) that pre-questioning procedures like that used by Berlyne (1954b) facilitate learning by inducing 'inspective behaviour', in any case, it seems very probable that the more strongly a subject attends to a particular experiment, the greater is the likelihood that he will rehearse and thus assimilate information about it.

3.6. General Discussion and Conclusions

The basic aim of these studies was to examine the notion that curiosity behaviour is motivated by a discrepancy between the individual's existing knowledge-structure and present experience, and that it is evoked most strongly by an intermediate level of discrepancy. Previous empirical studies had attempted to test such a discrepancy hypothesis in the field of perceptual exploration or attention. The present research, taking as its starting-point theoretical formulations proposed by Berlyne, Piaget and Ausubel, was concerned with verbally-expressed curiosity about symbolic material, namely, accounts of psychological experiments, in secondary school children.

On a 'weak' form of the hypothesis, it was predicted that patterns of question-asking about the psychology experiments described would vary systematically with age and intelligence. Older and more able boys in a sample of eleven to fifteen year olds were found to request more information than their younger and less able counterparts, and also to ask more varied and more 'mature' questions. These results were taken to indicate that the materials were more readily assimilable for them, and closer to their 'optimal' discrepancy level. However, all groups expressed an approximately equal degree of interest in the material, and the relative amount of interest expressed in the individual experiments was predictive overall of the numbers of questions that were asked about them.

This suggested that the more cognitively advanced subjects requested more information largely because they were more capable of doing so; they were better able to relate the material to their existing conceptual systems, either because these systems were more fully developed or because their capacity to process new information was superior. The actual motive or incentive to express curiosity seemed to stem from other factors. On the basis of Berlyne's theory and previous research, the roles of two possible determinants were examined; these were, firstly, how far the information in the accounts conflicted with the previous knowledge or ideas of the subjects and second, how relevant it was perceived to be. It was found that levels of interest in and questioning about the experiments were positively related to judgements of 'surprisingness' and 'value' in a sample of fourteen year old girls, while the relative assimilability of the experiments, measured in terms of subjects' ability to answer comprehension questions about them, tended to predict amount of questioning but not how interesting they were judged. The disposition to seek knowledge, it was concluded, is determined by a combination of intrinsically and extrinsically motivated needs to reduce uncertainty, while the capacity to do so is influenced by the individual's ability to relate present and past experience to each other.

Since seeking knowledge is a prelude to integrating it, it was predicted that variables which affected the former should also affect the latter; interest in the experiments was positively related to immediate retention of their content in a group of twelve year old boys though this was not attributable exclusively to either conflict or relevance. It was suggested that both of these are likely to enhance learning by mobilising the learner's attention.

As with all research, one must recognise the problem of how far the present conclusions can be generalised, given the restricted nature of the experimental arrangements. Although the materials and procedures used do appear to have provided a fairly realistic and effective means of exciting the subjects' curiosity, it is necessary to bear in mind that the children were behaving in a structured situation; they were given specific instructions and were attending to specific stimulus-matter. In 'real-life' situations, on the contrary, curiosity tends to occur spontaneously, and is not necessarily correlated with identifiable stimuli, though some degree of structure may exist, for instance, in the classroom. Another reason for caution is the fact that the correlations demonstrated here among question-asking, comprehension, retention and ratings were based on group rather than individual data, and although intra-group agreement was usually statistically reliable, it was not very high. Furthermore, there was considerable variation among the results for the individual streams in the second investigation.

Clearly, then, the conclusions drawn here must be regarded as tentative starting-points for further research sampling a wider variety of situations and employing more refined methods, but in the meantime, some discussion is called for concerning general issues raised by the present studies.

Types of Discrepancy. The results of the second investigation (section 3.3) indicated that question asking was influenced by two distinct types of discrepancy. One of these, indexed by the comprehension measure, appears to be equivalent to 'complexity' as defined in studies of exploratory behaviour, in that it involves merely an extension or addition to the individual's previous experience. The type indexed by ratings of surprise, on the other hand, depends on a direct clash with previous experience, and thus seems equivalent to 'incongruity': while the individual is sufficiently familiar with the basic elements of the new material to relate them to his existing ideas, the relationships between the elements (e.g. animals enjoying electric shocks) are strange and unexpected. Both types of discrepancy can be subsumed under the category of 'novelty'. Obviously, some degree of novelty is a pre-requisite for curiosity, — one cannot accommodate to what has already been assimilated — and as Hutt (1970b) points out, it is probably impossible to isolate novelty and complexity empirically. It is suggested, however, that whereas surprise can instigate information-seeking autonomously by generating conceptual conflict, mere 'remoteness' may only be operative in doing so when a need for further information is felt on some external grounds. If this is the case, then some doubt is cast on Berlyne's assumption (*e.g.* 1966b) that all collative variables affect curiosity in the same manner. A study relevant to this point is reported by Greenberger, Woldman and Yourshaw (1967). They found that groups of subjects given a prior 'curiosity set' or 'set to remember' both looked longer at collative stimuli significantly longer than a control group given 'neutral' instructions, but for the former, attention was prolonged predominantly to incongruous pictures, while for the latter the effect stemmed mainly from increased attention to highly complex patterns. Moreover, most of the control subjects, when questioned after the experiment, reported having developed a self-induced curiosity or remembering set, and the same relationships obtained for them. It seems, then, that subjects tended to look longer at highly complex stimuli when they thought that there was some extraneous reason for identifying or registering them, whereas attending to incongruous stimuli did not require an additional incentive.

It is notable that Berlyne, in different statements of his theoretical position, has emphasized different internal constructs mediating between collative variables and specific exploration. Compare, for example 'the condition of discomfort, due to inadequate information, that motivates specific exploration, is what we call 'curiosity' ', (1966a, p. 25) with 'what underlies all the collative properties and gives them their common motivational effects in conflict, by which we mean a condition in which incompatible, mutually interfering patterns of behaviour are simultaneously mobilised.' (1964, p. 23). On the present argument, the 'inadequate information' interpretation is more applicable to complexity (whether ikonic or symbolic), with the rider that the subject must have some reason for feeling that his information is inadequate, while the 'conflict' interpretation is more applicable to incongruity or surprise. It also seems reasonable to suppose that 'novelty' as defined in the habituation-recovery paradigm owes its effect to conflict, since the change stimulus should be expected to violate expectancies generated by the repeated exposures of the habituated one.

The discrepancy hypothesis. The present studies, like those generated by Kagan's (1967) hypothesis, have not shown curiosity to be related in a curvilinear fashion to either of the discrepancy parameters: interest and questioning appeared to increase monotonically both with the 'proximity' of the material and with the degree of conflict it aroused. This may be attributable to the fact that the materials did not sample a sufficiently wide section of the discrepancy continuum, but in any case, as pointed out above, discrepancy in the sense of remoteness from previous experience, at least within the fairly narrow limits sampled here, seemed to act at a cognitive rather than a motivational level. While an intermediate level of novelty, or 'the old in the new', probably does provide the optimal preconditions for curiosity, — one does not want to find out either what one knows already or something entirely disconnected from previous knowledge — what motivates knowledge-seeking in the absence of external incentives is the contradiction between the old and the new; as Berlyne's experiment (1954b) showed, curiosity can be at its highest when extremely familiar concepts, *i.e.* those about which one has the strongest beliefs and expectations, are presented in an unfamiliar context. Similarly, while it is to be expected that the time spent exploring stimuli will be an inverted-U function of their complexity-level (as for example in Berlyne & Lewis, 1963), there is no reason to suppose, as Faw (1970) does, that it should be similarly related to their level of incongruity.

The measurement of curiosity. It was observed in chapter 2 that the psychometric approach to curiosity has not proved to be a very fruitful one. If the expression of curiosity is dependent upon an interaction between the individual and what he is seeking information about, it is not appropriate to assume, as some researchers have, that a subject who, for example, shows more prolonged exploration or asks more questions than another in a test situation is more 'curious'. There may well be stable differences between individuals in the disposition to seek information or knowledge, and these may be linked to traits such as creativity (Maw & Maw, 1970), or to more general aspects of cognitive style (Ashton, *op. cit.*, chapter 7). However, curiosity is necessarily expressed about something, and the determining role of the cognitive and motivational factors outlined above is likely to be at least as great as that of a general curiosity trait. To cite an illustration of the confusion that can follow from ignoring this point, the fact that teachers' ratings of children's curiosity are consistently correlated with intelligence test scores (*e.g.* Maw & Maw, 1964) has led Langevin (*op. cit.*) to conclude that 'teachers misidentify the brighter child as the curious one.' (*p.* 369). On the present argument, the brighter child will tend to be the curious one in the classroom; he should be expected to be better equipped to express interest in curriculum content, and studies of classroom questioning (*e.g.* Fahey & Corey, 1941; Pritchard, 1970) suggest that this is generally the case. Another point that should be made in this regard is that curiosity should be influenced by specific as well as general information-processing capacity, with the result that individuals will be differentially curious about different subject-matter areas, though this could also stem from different views of what is worth knowing.

Relevance

Notions of 'relevance' or 'value', based on external factors, have been distinguished from conflict as a source of motivation for seeking and assimilating information: subjects apparently expressed interest partly because they considered information about the experiments to be worth having. Ashton similarly noted a distinction between 'curiosity' and 'interest': children asked questions about her museum objects either because they were strange and unfamiliar or because they were similar to things which had interested them previously.

In very general terms, any form of motivation or reinforcement owes its effects to making learning worthwhile; an experimental animal, for example, will acquire those responses which are relevant to the satisfaction of hunger or the termination of pain, just as schoolchildren, as Skinner (1969) observes, will learn in order to avoid the consequences of not doing so. However, the children in this study did not stand to gain rewards or avoid punishment as a result of seeking and acquiring information about the experiments: ideas of relevance related directly to the content of the materials, and were thus not wholly extrinsic.

It is possible that different types of extrinsic incentive may interact with the purely intrinsic one of conflict-reduction in different ways. In the present research, they appear to have operated in a complementary way, and indeed were probably not completely independent from each other. Ausubel (*op. cit.* chapter 10) recommends that schools should exploit extrinsic incentives for learning — competition, the desire for approval and achievement, rewards and punishments — in conjunction with attempts to foster 'cognitive drive', *i.e.* the desire to know for the sake of knowing. However, he also suggests that the frequently reported decline in children's curiosity over the school career may stem from an over-emphasis on extrinsic at the expense of intrinsic incentives (see chapter 2, section 2.7); in other words, the child develops the attitude that the only things that are worth knowing are those which bring about some direct external benefit for him.

The feasibility of the idea that the two sources of motivation can be mutually antagonistic is borne out by an experiment by Deci (1970) who found that students' interest in performing intrinsically interesting tasks — solving mechanical puzzles and writing headlines for college newspapers — fell off after they had been provided with monetary rewards for doing them. Ausubel argues that since meaningful learning can provide its own reward, cognitive drive is 'potentially the most important kind of motivation in meaningful learning' (*p.* 367). Although it is seen mainly as a by-product of successful learning, Ausubel and Robinson (1969, chapter 12) make some tentative suggestions as to how teachers might utilise discrepancies and apparent contradictions in curriculum content to generate conflict and thus arouse pupils' attention and interest. But how far 'disinterested' curiosity arising from conflict can co-exist with external reinforcement contingencies, and under what conditions it is incompatible with them, are problems that require further empirical consideration.

References

Ashton, P.M.E. *A study of the curiosity of ten and eleven year old children.* Birmingham: Unpub. Ph.D. thesis, 1965.

Ausubel, D.P. *Educational psychology: a cognitive view.* New York: Holt, Rinehart & Winston, 1968.

Ausubel, D.P. & Robinson, F.G. *School learning.* New York: Holt, Rinehart & Winston, 1969.

Berlyne, D.E. A theory of human curiosity. *Brit. J. Psychol.,* 1954, *45,* 180-191(a).

Berlyne, D.E. An experimental study of human curiosity: *Brit. J. Psychol.,* 1954, *45,* 256-265(b).

Berlyne, D.E. Novelty. *New Society,* 1964, *87,* 23-24.

Berlyne, D.E. Curiosity and exploration. *Science,* 1966, *153,* 25-33(a).

Berlyne, D.E. Conditions of prequestioning and the retention of meaningful material. *J. Educ. Psychol.,* 1966, *57,* 128-132(b).

Berlyne, D.E. Children's reasoning and thinking. In P.H. Mussen (ed.) *Revised edition of Carmichael's manual of child psychology.* New York: Wiley, 1970.

Berlyne, D.E. & Frommer, F.D. Some determinants of the incidence and content of children's questions. *Child Developm.,* 1966, *37,* 177-189.

Berlyne, D.E. & Lawrence, G.H. Effects of complexity and incongruity variables on exploratory behaviour and verbally expressed preference. *J. Genet. Psychol.,* 1964, *71,* 21-45.

Bernstein, B.B. A sociolinguistic approach to socialization. In F.W. Williams (ed.) *Language and poverty.* Chicago' Markham, 1970.

Day, H. Looking time as a function of stimulus variables and individual differences. *Percept. Mot. Skills,* 1966, *22,* 423-428.

Dayton, C.M. *Design of educational experiments.* New York: McGraw-Hill, 1970.

Deci, E.L. The effects of externally mediated rewards on intrinsic motivation. *Diss. Abs.,* 1970, *31A,* 4262.

Duffy, M.G. Expression of curiosity, interest and retention. University of Southampton: M.Phil., 1972.

Fahey, G.L. & Corey, S.M. Inferring level of mental activity from pupils' classroom questions. *J. Educ. Res.,* 1941, *35,* 193-200.

Faw, T. T. The effect of stimulus incongruity on the free looking time of adults and children. *Psychon. Sci.,* 1970, *19,* 335-337.

Greenberger, E., Woldman, J. & Yourshaw, S.W. Components of curiosity: Berlyne reconsidered. *Brit. J. Psychol.,* 1967, *58,* 375-386.

Hovey, D.E., Gruber, H.E. & Terrell, G. Effects of self-directed study on course achievement, retention and curiosity. *J. Educ. Res.,* 1963, *56,* 346-351.

Hutt, C. Specific and diversive exploration. In H. Reese & P.L.P. Lipsitt (Eds) *Advances in child development and behaviour, Vol. 5.* New York: Academic Press, 1970.

Kagan, J. On the need for relativism. *Amer. Psychologist,* 1967, *22,* 131-142.

Langevin, R. Is curiosity a unitary construct? *Canad. J. Psychol.,* 1971, *25,* 360-374.

Maw, W.H. & Maw, E.W. *An exploratory investigation into the measurement of curiosity in elementary school children.* Co-op. Research Project 801, Univ. of Delaware, 1964.

Maw, W.H. & Maw, E.W. Nature of creativity in high and low curiosity boys. *Dev. Psychol.,* 1970, *2,* 325-329(b).

Nicki, R.M. & Shea, J.F. Learning, curiosity and social group membership. *J. Exp. Child Psychol.*, 1971, *11*, 124-132.

Paradowski, W. The effect of curiosity on incidental learning. *J. Educ. Psychol.*, 1967, *58*, 50-55.

Pielstick, N.L. & Woodruff, A.B. Exploratory behaviour and curiosity in two age and ability groups of children. *Psychol. Repts.* 1964, *14*, 831-838.

Pielstick, N.L. & Woodruff, A.B. Exploratory behaviour in children. *Psychol. Repts.*, 1968, *22*, 515-531.

Pritchard, M.F. Children's classroom questions — How many? What kind? Their effects on individual growth. *Diss. Abs.*, 1970, *30A*, 3353.

Rothkopf, E.Z. Some theoretical and experimental approaches to problems in written instruction. In J.D. Krumboltz (ed.) *Learning and the Educational Process.* Chicago: Rand McNally, 1965.

Skinner, B.F. Contingency management in the classroom. *Bull. Brit. Psychol. Soc.*, 1969, *22*, 224 (abstract).

APPENDIX 1

Sample page

Experiment 1

The Experimenter showed small groups of subjects a card with a line drawn on it, and then another card with three lines drawn on it. One of these lines was equal in length to the line on the first card, one was much shorter, and the other was much longer. The subjects were then asked to say which of these three lines was the same length as the first one.

However, all except one of the group had been secretly told by the Experimenter to give a wrong answer, so that the other subject (the genuine one) would find himself disagreeing with all the other members of his group.

About one in three of all the genuine subjects ended up agreeing with the rest of their group, even though it was quite clear that the answers they were giving were wrong.

Do you find this very interesting/quite interesting/only slightly interesting/dull/very dull/? (Tick the one that is true for you)

Your questions:

1. (Space was left for ten questions)

10.

Experiment 2

Infant monkeys were reared in cages without their mothers, but each cage was provided with two imitation mothers, one made out of wire netting with a wooden block for the head, the other made from a big block of wood, and covered in sponge and towelling cloth. Either one of the imitation mothers could be fitted with a feeding bottle, which could be placed in the centre of its breast.

It turned out that the infants would always spend much more of their time clinging to the cloth-covered mother, even if they could only get fed by the wire one. Sometimes, when they wanted to be fed, they would even cling to the cloth mother, and lean over and suck at the bottle attached to the wire mother.

Experiment 3

Subjects were asked to sit in front of a white screen, and asked to imagine a picture, say, of a banana being displayed on the screen. Then, without the subject knowing, a very faint picture of a banana would be projected onto the screen with a slide projector.

All the subjects, who were university students, said afterwards that the picture which they saw on the screen was the one which they had imagined; none of them realised that there was in fact a *real* picture on the screen.

Experiment 4

Hungry chimpanzees were taught how to put a counter into a slot-machine to get out a grape or a raisin, and they were then given the chance to pull very heavy boxes into their cages in order to get counters which were hidden in them.

The chimps would pull in these boxes even if they were not able to use the counters in the slot-machine immediately; they would hoard large numbers of them, patiently waiting for the chance to spend them.

Later, the Experimenter taught the chimps to use a red counter to get food, a blue one to get water, and a white one to get out of their cages and have a run round. Then, the chimps would work hardest for whatever colour counter would satisfy their greatest need.

Experiment 5

A subject speaks into a microphone connected to a tape recorder. The tape recorder plays the speech back to the subject through a pair of earphones, but before it does so, it stores it for a fraction of a second, so that there is a short delay between the time the subject speaks a word and the time he hears it.

As a result of this delay, the subject falters and stutters in his speech, and he may even be forced to stop speaking entirely.

Experiment 6

A method often used by psychologists to study the brains of animals is to drill a tiny hole through the animal's skull in order to stick a very fine length of wire into its brain; a weak electric current can then be passed through the wire.

A psychologist in Canada did this with some rats, and found that if the wire was stuck into a certain part of the brain, the rats seemed to enjoy receiving this slight electric shock.

The rats seemed to enjoy it so much that if they were put into a cage where they were allowed to press a lever which would switch on the current for a fraction of a second, they would press the lever over 5,000 times in an hour. Some would even go on pressing the lever non-stop for twenty hours, until they finally dropped from exhaustion.

Experiment 7

The Experimenter shows a six year old child two beakers of the same size, each filled to the top with water. He asks the child, "Is there the same amount of water in the two beakers?" The child agrees that there is. The Experimenter then pours all the water from one beaker into a long, thin bottle, and all the water from the other beaker into a short, fat bottle. He then asks the child, "Suppose you are very thirsty and want to drink the water in one of the bottles. Is there just as much water in each bottle?"

The child answers that there is more water in the long, thin bottle because it is bigger. Another six year old says that there is more in the short, fat bottle, because it is bigger. No six year old realises that there is actually the same amount of water in both bottles.

Experiment 8

A number of cockroaches were kept in separate cages, and if they went to a certain corner of their cage, they would be given an electric shock through the floor. They soon learned not to go into that corner. Next, half of the cockroaches were placed in a dark, damp passageway where they remained quite still for 24 hours, while the other half were left in dry, brightly-lit cages.

When they were tested again, the cockroaches who had been kept in the passageway remembered not to go into the corner of the cage where they had received the shock, while the other half had to learn this all over again.

Experiment 9

Albert was an 11-month old child who was very fond of animals. When he was shown a white rabbit, he was delighted and made no effort to get away from it. Later, he was shown a white mouse, and at the same time, somebody suddenly banged a gong behind him. This had the expected effect – he shrank back in fear. This happened a few more times.

Then, he was shown the white rabbit again. But this time he was scared of it and tried to get away from it. Later, he was shown other white furry objects. He was frightened by all of them, even by a man with a white beard.

Experiment 10

The Experimenters set up a wooden model of a duck and by remote control made it move around a track, making quacking noises. They then showed the model to newly-hatched ducklings for ten minutes.

If the ducklings were shown the model between twelve and seventeen hours after they hatched, they would follow it round the track as if it was their mother. If they were shown the model a little earlier or a little later after hatching, they were not so likely to do this.

Sources of the descriptions

1. Asch, S.E. Studies of the independence and submission to group pressure. I : A minority of one against a unanimous majority. *Psychol. Monogs.*, 1956, *7*, Whole No. 416.
2. Harlow, H.F. Love in infant monkeys. *Sci. Amer.*, 1959, *200*, 68-74.
3. Perky, C.W. An experimental study of imagination. *Amer. J. Psychol.*, 1910, *21*, 422-52.
4. Wolfe, J.B. Effectiveness of token-rewards for chimpanzees. *Comp. Psychol. Monogs.*, 1936, *12*, No. 60.
5. Lee, B.S. Effects of delayed speech feedback. *J. Acoust. Soc. Amer.*, 1950, *22*, 824-6.
6. Old, J. and Milner, R. Positive reinforcement produced by electrical stimulation of septal area and other regions of the brain. *J. Comp. Physiol. Psychol.*, 1954, *47*, 419-27.
7. Piaget, J. *The child's conception of number.* London: Routledge, 1952.
8. Minami, H. & Dallenbach, K.M. The effect of activity upon learning and retention in the cockroach. *Amer. J. Psychol.*, 1946, *59*, 1-58.
9. Watson, J.B. & Rayner, R. Conditioned emotional reactions. *J. Exp. Psychol.*, 1920, *3*, 1-14.
10. Hess, E.H. Imprinting. *Science*, 1959, *130*, 133-4.

APPENDIX II

The Classification of Questions

The sixteen categories used to classify questions were arrived at as a result of examination of data not used in the main experiment. Each question was categorised in terms of two dimensions:

1. Whether they were open or closed. Open questions are those which are introduced by an interrogative word and which may receive a large variety of different answers, while closed questions are those requiring a yes or no answer.

2. What sort of information they request. Eight referential categories were used, and those are labelled according to an initial letter as follows:

E. Requesting an explanation of the results of the experiment.

P. Requesting information about the purpose of the experiment, or what it proves or demonstrates.

J. Requesting a justification of the experimental procedure, or part of it.

D. Requesting more detailed information regarding the procedure or results.

C. Requesting information about the consequences of the experiment for the subjects.

M. Suggesting a manipulation or modification of the independent variables.

G. Requesting information about the inter- or intra-species generality of the results.

S. Registering surprise at, or some affective response to, some aspect of the experiment.

To obtain a check on reliability, the responses of eight subjects — two from each group — were coded by two scorers. The levels of agreement were 95% for the open-closed dimension and 81% for the referential dimension.

Examples (Figures in brackets following each example refer to the number of the experiment which elicited the question.)

E. Explanation

(a) *Open*

This category includes questions which request a complete explanation of the experimental results:

Why do the cockroaches who had been kept in the passageway remember not to go in the corner where they had received the electric shock and the cockroaches who had been in the light cages have to learn all over again?

or they may ask for a partial or incomplete explanation —

The dry ones forgot. Why?
Why did the wet ones not forget? (8)

Some questions do not make explicit what is to be explained —

Why was this? (2)
How do you account for this? (6)

(b) *Closed*

These questions may specify what needs to be explained:

Did the monkey stay with the imitation monkey because it was covered in cloth because it flet the warmth? (2)

or not

Is this to do with the cloth one being soft and warmer and comfortable to cling to than the wire mother? (2)

Was the wire attached to the nerve centres? (6)

P. Purpose

(a) *Open*

The questioner may ask about the purpose or point of the experiment:

What is the point in doing it? (3)

What is the use in this? (1)

or about what is proved or demonstrated by the experiment:

What does this experiment show? (1)

What was proved from this experiment? (2)

(b) *Closed*

Is this experiment done to stop people stuttering in their speech? (5)

Does this show that people go by what other people say? (1)

J. Justification

(a) *Open*

Why only one subject at a time? (1)

Why did they stick the wire in the rat's brain? (6)

Why didn't they do it to mice? (6)

(b) *Closed*

Is the wire used, used for a reason, or is it used simply because the wire is a good conductor of electricity? (6)

Did the materials used (*i.e.* cloth and wire) need to be significantly these two? (2)

Did the cockroaches have to be left in the dark passageway for 24 hours exactly, or could it have been just a few hours? (8)

D. Detailed Information

(a) *Open*

How was the experiment done?

How many in a group were there? (1)

What made the rats survive the electric current? (6)

What happens when the wooden one runs out of milk? (2)

(b) *Closed*

Were the models very life-like? (6)

Were the subjects half-drugged before the experiment was started? (3)

Were the rats tame? (6)

C. Consequences

(a) *Open*

How long was he like this? (9)

What would happen to the ducks in the end? (10)

(b) *Closed*

Would this not put the child off all animals? (9)

Did the rat die after the experiment? (6)

Does this have any ill-effects on the rats? (6)

Will this wear off as he gets older? (9)

M. Manipulation/Modification

(a) *Open*

Why don't you get people instead of animals?

If you changed them over after the first experiment, so that both cockroaches went in a dark damp passageway and a dry, brightly-lit cage what would happen? (8)

What would happen if you gave it a big current? (6)

APPENDIX III

Ratings and Retention Test

Since the complete test occupied seventeen pages, we confine ourselves to a single example. Full details are available in Duffy (1972).

Example

Subjects were asked to sit in front of a white screen, and asked to imagine a picture of a banana being displayed on the screen. Then, without the subject knowing, a very faint picture of a banana would be projected onto the screen with a slide projector.

All the subjects, who were university students, said afterwards that the picture which they saw on the screen was the one which they had imagined; none of them realised that there was in fact a *real* picture on the screen.

A. Underline what you think is the right answer to each question.

1. What were the subjects asked to do?
    - (a) To draw a banana on a screen
    - (b) To imagine a picture of a banana
    - (c) To eat a banana
    - (d) To let their minds go blank
2. What did the experimenter do that the subjects did not know about?
    - (a) Took away the screen
    - (b) Hypnotised the subjects
    - (c) Drew a banana on the screen
    - (d) Projected a faint picture of a banana on the screen
3. What did the subjects say at the end of the experiment?
    - (a) That they had only been imagining a banana
    - (b) That it had all been a waste of time
    - (c) That they felt confused
    - (d) That they had seen a real picture on the screen
4. What did they not realise?
    - (a) Thay they had been taking part in an experiment
    - (b) That the experimenter had hypnotised them
    - (c) That there had been a real picture on the screen
    - (d) That it was all in their imagination

B. For the next 3 questions underline the answer that is true for you.

1. How surprising do you find the outcome of this experiment?
    - (a) Very surprising
    - (b) Fairly surprising
    - (c) Hardly surprising at all
    - (d) Not surprising -- just as you would expect
    - (e) Knew it already anyway
2. How interesting do you find the experiment?
    - (a) Very interesting
    - (b) Quite interesting
    - (c) Only slightly interesting
    - (d) Dull
    - (e) Very dull

And give your reasons in a few words:

3. How valuable do you think it is to know about this experiment?
   - (a) Extremely valuable
   - (b) Quite valuable
   - (c) Only of quite little value
   - (d) Hardly worth knowing
   - (e) Completely worthless

And give your reasons in a few words:

CHAPTER 4 CURIOSITY AND QUESTIONS IN NATURAL SETTINGS

4.1 EARLY EXPERIENCE IN THE HOME (J. ARNOLD AND W.P. ROBINSON)
4.1.1 Children's Questions and Mothers' Answers: Study I
4.1.2 Children's Questions and Mothers' Answers: Study II
4.2 A WEEK-END OF CROSS-CULTURAL STUDIES (W.P. ROBINSON)
4.3 A WEEK OF SPORTING (C.D. CREED AND W.P. ROBINSON)
4.4 CONVERSATIONS WITH TEENAGERS (W.P. ROBINSON)
4.5 AT THE YOUTH CLUB (M.C. DUFFY)
4.6 IN THE SCHOOL (W.P. ROBINSON AND L. ABRAMSKY)
4.6.1 Questions about General Science
4.6.2 Questions about Sexual Matters

CHAPTER 4

CURIOSITY AND QUESTIONS IN NATURAL SETTINGS

Introduction. When we conduct investigations under laboratory conditions we horse-trade, accepting the advantages of stricter control in exchange for effects of the unnaturalness of the settings on people's behaviour. Whether to observe natural variations or manipulate them is a false dilemma, weakly resolved by arguing 'it all depends . . .', strongly resolved by requiring that both be done and consistency of results achieved. If Berlyne's theory applies only to babies staring at geometrical shapes, it is less immediately relevant to educational practice than if it can be proved robust enough to survive the hurly-burly of the classroom. To supplement and complement the investigations we conducted with specially designed materials administered in controlled settings, we put out enquiries about ongoing special activities with questions, we sought to evaluate the consequences of attendance on courses, and we talked with teenagers.

There are snags about these pursuits. Many more such ventures are likely to be launched than will sail. The effect of the high mortality rate is accentuated by a high incidence of shipwrecks during the voyage, stemming from administrative muddles and losses of crucial information which then marr otherwise satisfactory investigations.

We advertised in 'Dialogue', we asked around, and managed to carry through to completion the investigations reported in this chapter. No replies at all came from our plea in 'Dialogue', but word of mouth produced more response. Six activities are covered. The question-answer exchange in the home (4.1) was thought to be significant for the theory advanced in chapter 2 and to have direct possibilities of transfer to educational settings. The evaluation of the two courses (4.2, 4.3) both involved children undertaking unfamiliar experiences, and seemed to be admirably suited to our interests. In neither case were the organisers primarily interested in curiosity, although both were hoping in part to cultivate and direct interests. Our informal conversations (4.4, 4.5) were originally intended to serve as breeding grounds for ideas of investigations to conduct. We hoped that such contact would help to foment subtle methods of measuring boredom and eliciting or stimulating questions. This forlorn hope is transmuted into such general points of interest as were thrown up in the settings.

The Head of a Science Department wrote in to say he had instituted question-answer sessions in his department. Periodically pupils would write out individual questions on slips of paper. These would be handed in and he would endeavour to answer them on the spot. The original idea had been to provide pupils with an anonymous context in which to ask questions about Health Education, particularly about sexual matters, but this activity had broadened into the realms of general science. Since these sessions had become part of the woof and warp of teaching, they may be considered relatively natural, and we conducted some analyses of these (4.6).

4.1. Early Experience in the Home (J. Arnold & W.P. Robinson)

4.1.1. Children's Questions and Mothers' Answers: Study I

Introduction and Method.

The study of goings-on at home was not covered by our terms of reference, but when an opportunity of obtaining a large, if biased, sample of mothers presented itself, it was easy to think of sound reasons for moving beyond the school environment. The

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laws and explanations of behaviour that psychologists pursue are not specific to confined environments. The factors relevant will operate in the same fashion both at home and in school. The relationships obtaining between the behaviour of mothers and questions posed to them by their children will obey the same principles as those which govern the teacher-child situation. Given our general ignorance about the determinants of the incidence and quality of children's questions, and the administrative difficulties of investigating some aspects of the problem in schools, the opportunity of gaining the co-operation of several hundred mothers through an appeal on the BBC 'Woman's Hour' programme was too good to miss.

We asked mothers to complete diaries of thirty nine successive 'wh' questions asked by their children along with the answers they gave. With the aid of some questionnaires we hoped to achieve the following:

1. A description of the incidence and type of questions asked by children of several age and social class groups. A subsidiary consequence of this analysis should have been some indication of the major areas of interest of children of various ages.
2. An analysis of correlates and possible determinants of the questions children ask.

Three levels of examination were envisaged in terms of:

(i) Variations in maternal strategies of answering questions asked.
(ii) Individual differences in maternal attitudes towards child rearing.
(iii) Sociological based differences.

For the first and second of these, we had no previously validated measuring instruments that could be included in the study, and we had to construct what we hoped would be useful indices from the data collated.

The aim of the project was to collect and examine examples of the question and answer exchange between children and their mothers within the home. Nearly two hundred and fifty mothers returned varied amounts of information of whom two hundred and seventeen had recorded one question or more from their children of primary school age. Respondents had been asked to record a total of thirty nine questions – three instances each of questions beginning with 'where', 'when', 'what', 'which' and 'who', and twelve each beginning with 'how' and 'why' – but many scripts were incomplete. This was understandable in view of the nature of the operation which required the writing down of spontaneous questions and answers with no control over the time or place that a question and answer exchange might occur and only our written instructions as a guide. Although mothers had also been asked to note times and dates of questions, this information was so incomplete that we had to abandon hopes of finding out anything about the rate at which different children were asking questions.

Respondents were also asked to provide background information about their work and education, and to indicate their views on three different questionnaires designed to assess their attitudes to child rearing, including their expectations for the development of self-reliance in their children and the importance they placed upon the role of language in bringing up children. This information was asked for because it was hoped to relate maternal attitudes to child rearing to the questions asked by children and with the answers given by mothers.

As several mothers had sent in question and answer diaries for more than one child, examples of questions had come from three hundred and three children altogether, of whom one hundred and sixty nine were boys and one hundred and thirty four girls. Nearly 6,000 initial questions beginning with the specified interrogative words had been recorded, and on many occasions further questions arose in related dialogue. A preliminary examination of these records showed that the majority of questions had come from younger children, particularly the five to seven year old age group.

While all the records were of interest, the sheer number of questions, the age range of the children asking the questions, and the variation in the number of questions recorded per child, posed problems for the analysis of these data. It was therefore decided to select a sample of fifty question and answer diaries where thirty or more questions had been recorded, and as far as possible to maximise the similarity of age of the children concerned. The analysis was conducted in two stages:

1. All questions from a sample of fifty children aged five to seven were examined and categorized together with their mothers' answers and any related dialogue.
2. The scores on the three attitude schedules of the fifty mothers of these children were submitted to a correlational analysis in an attempt to identify and correlate specific attitude clusters to various aspects of bringing up children. Comparisons were then made between the records of differing groups of respondents according to the attitudes expressed, the children's questions, and the mothers' answering behaviour.

Results

Questions and Answers

The children's questions. The total number of questions recorded for this sample of fifty children was 2,127. When studying these questions we were interested in three main characteristics: the form of the question, the focus of the question, and the apparent purpose of the child in posing each question. Every question was categorized as simple or complex in its grammatical structure, a simple question being expressed in one main clause, while a complex question contained more than one verb. The majority of questions (72%) from this sample of fifty children were simple in form, though not necessarily in content (*e.g.* Who made God?). Examinations of the focus of the content of questions showed that more than half the questions were concerned with the immediate environment, apparently stimulated by people, objects or activities within the home or within the here-and-now situation of the child. A further quarter reflected interest in matters outside the child's own experience, often relating to general knowledge, while about half this number again were categorized as abstract, referring to theoretical ideas and principles. Abstract questions were more numerous than self-centred questions indicating perhaps that this age group is moving away from the self-centred stage of development, becoming less concerned with themselves and displaying more interest in less tangible matters. However the immediate environment remained the predominant focus of questioning (see section 4.6. for further information about this topic). Each question was also categorized according to the apparent purpose of the child in asking it. While it may be true that children sometimes use questions in a manipulative fashion to gain attention, such intentions could not be clearly inferred from these data. The purpose ascribed to each question was derived from the content of the question itself. It appeared that the predominant purpose of these children in asking questions (90%) was to seek information. The range of information sought was extensive, from the comings and goings of daily life (*e.g.* Who was that on the phone?) to questions of general knowledge (*e.g.* Which is the fastest thing in the world?). The remaining ten per cent of questions reflected other purposes, such as seeking advice, instruction, action, opinion, reassurance, or expressing protest.

Naturally occurring questions would seem to provide examples of a child initiating a conversation with another person. If, when he asks his mother questions, he becomes accustomed to receiving answers which satisfy him, and/or stimulate him to further thought, he may be more likely to use questions as instruments of learning rather than just a means of gaining attention. He may learn to direct his questions with increasing precision, providing himself with a useful tool for solving problems.

The mothers' answers. The context of asking as well as the content of questions presumably affected the answers given by mothers, but as this could not be assessed in any way, the question and answer exchanges were analysed in isolation, ignoring this source of variation.

The two main aspects of answers considered were the tactics mothers adopted in response to their children's questions and the occurrence of certain features in their answers. A child will need answers of order and clarity to helphim to build up and consolidate representations of experience and knowledge, and the majority of these answers (70%) were definite and clearcut. But not everything in the world can be neatly ordered and explained on all occasions, and answers were sometimes couched in more hesitant terms, using tokens of uncertainty such as 'I think' or 'perhaps', while conditional answers illustrated the dependence of one fact, process or idea upon another. Inevitably, mothers cannot always answer their children's questions, their lack of specific knowledge possibly being one main limitation; in several instances mothers admitted ignorance but went on to offer tentative answers or suggest ways of finding them out.

The features of answering behaviour noted were intended to reflect what a mother was trying to do with her answer. The most frequent response to a question was to provide the specific information requested, but mothers would often attemtp to extend their children's interest and knowledge, going beyond the immediate demands of a question. They could also add meaning to their answers by relating them to their children's previous experience and knowledge, or by explaining the existence of underlying principles. In such ways they could suggest a synthesis of information rather than simply offering a collection of arbitrary facts. It may also assist a child's understanding if his observations of specific phenomena can be linked together with other things, demonstrating the operation and interaction of processes. An interesting example of an answer containing three different features occurred in answer to the question 'What is a shadow?' 'It is a sort of gap in the sunshine. Look: See the sun shining on this book. If I put my hand over it the sun shines on my hand but not through it. So there is a hand-shaped space in the sunshine under it, and that is a shadow'.

Attempts to control children's behaviour directly also appeared in answers, and while these might be regarded as inhibiting for a child, such instances often provided examples of the way in which discipline situations can offer children opportunities for learning, especially when reasons rather than unsupported commands are given for constraints upon behaviour. Another feature noted was the encouragement given by mothers to independent thought, action or observations, in providing children with stimulating answers rather than simply satisfying ones.

While the tactics employed and the features present in an answer depended upon the nature of the question, they also reflected a mother's willingness to answer and illustrated her ability to do so. Appropriate and explicit answers to a child's questions may help him to build up a store of knowledge about the physical and social world which he can relate to whatever circumstances present themselves. He may learn to use his questioning ability to try to fill gaps in his knowledge and integrate new experiences.

Relationships between the attitude questionnaires, the children's questions and the answers given by mothers

Attitude questionnaires. The various questionnaires filled in were about children's self-reliance and achievement, the importance of language in bringing up children, and a number of more general beliefs about child rearing. When we looked at the latter to see how these attitudes went together the simplest (and over-simplified) contrast was between what we might call child-centred and good behaviour-centred attitudes.* Child-centred attitudes were made up of a laissez-faire approach, flexibility, preparedness to admit mistakes and allow disagreements, giving maximum freedom for the individual child to develop. The 'good behaviour' approach emphasized the need to bring order and structure into the child's life, initially creating as simple a world as possible for him to adjust to.

It appeared from comparisons among these questionnaires that mothers who were more child-centred were more likely to stress the importance of language when bringing up children, and expected their children to join in adult conversations and make decisions about their own affairs at an earlier age. But at the same time they had lower expectations about their children achieving early self-reliance and doing well at school.

Maternal attitudes and answering behaviour. When we looked to see whether mothers who expressed contrasting attitudes on the questionnaires also differed with respect to the answers they gave to their children's questions we found very few differences. The group of mothers expressing more child-centred attitudes were more likely to go beyond providing the specific information required by questions, attempting to extend their children's interest and knowledge. Mothers who stressed the importance of language in bringing up children had recorded more related dialogue following initial question and answer exchanges, and had also provided more answers explaining how things worked. The group of mothers expecting earlier self-reliance from their children had recorded more examples in their answers of the encouragement of independent thought or action, turning a question back on a child to think of an answer, or suggesting he seek his own answer, often providing guidance as to where this might be found.

Maternal attitudes and children's questions. Children of mothers who stressed early self-reliance tended to ask more questions focused upon themselves and the immediate environment, and fewer concerned with the wider environment or abstract matters. They also asked more questions expressing protest than the children of mothers who had reported less concern for early self-reliance; these children had asked more abstract questions as well as more questions relating to general knowledge. Similarly mothers stressing the importance of language had children whose questions were more likely to focus on problems beyond the immediate situation.

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*We of course pass no judgement. Any label we select may be taken by readers to imply that something is good or bad, but that is not our intention.

Answers of mothers and questions of children. While all the mothers in this sample had in fact answered their children's questions in accurate and appropriate ways, it was possible to separate out those who had offered comparatively fuller and more informative answers. We selected a group of mothers whose answers more often contained one or more of the following features: attempts to extend a child's interest and knowledge, the relating of answers to a child's previous experience, the encouragement of independent thought, action or observation, and the demonstration of underlying principles or processes in operation. Mothers whose answers contained a higher proportion of these features had children who asked more complex questions and who were more likely to ask questions seeking advice or instruction.

If we turn this problem round and look at how the answers of mothers differed for children who asked many as opposed to few complex questions had mothers who more often attempted to extend their children's interest and knowledge, relating answers to their children's previous experience, and demonstrating underlying principles and processes in operation. These mothers were also more likely to offer hesitant or conditional answers, suggesting perhaps areas of doubt to be explored.

This finding illustrates the relevance of a mother's answers to her child's questioning ability. It would appear that the ways in which mothers answered questions provided better evidence for prediction of their children's questioning behaviour than the attitudes they expressed on the questionnaires. From a child's point of view it might be suggested that the more often a child's question initiates a discussion with his mother or another adult, the more opportunities he will receive for expressing his own skills in language and question asking, and the more experience he will gain in listening to and making sense of the replies he receives. How attitudes are related to such behaviour we have yet to find out.

Discussion

A number of the initial goals had to be abandoned in the light of the data obtained. Any examination of correlates of the rate of question-asking was precluded for the reasons stated. No analysis of social class differences could be made, because insufficient WC mothers volunteered. No analysis of age differences could be made for because only the five to seven age group was represented in sufficient numbers.

Give these limitations, however, we have been able to show relationships between children's questions and mothers' answers. But is this a causal relationship? Is it the attempts to extend knowledge, the attempts to relate answers to the child's previous experience, *etc.* that cause the child to ask more complex questions? While this might be the most obvious guess, it is also possible that it is the child who has set the pace; his indefatigable questioning stimulating mothers to offer a wider range of answers or causing mothers to adapt to his needs if they are to enjoy reasonable peace and quiet. More likely, the two are interdependent and interact. To provide a set of empirically-based answers teasing out the causal network would require a number of further investigations. In the meantime, we might feel constrained to take the view that answers given do influence subsequent questions.

To transfer the results to the school situation, the implication would be that if teachers wish to increase the questioning skills of their children, they should answer the questions posed along the lines outlined above. The sampled underlying attitudes of mothers seem to have less relevance to children's questions than do their answering tactics. It may be that we failed to tap the relevant attitudes or that our instruments for measuring these were inadequate. A second possibility is that there may be a sufficient degree of discontinuity between attitudes held and behaviour manifested to render attitudes poor predictors of performance. If this is so and one is interested in developing questioning skills in children, then it would seem sensible to concentrate on teaching answering skills rather than certain types of attitudes. Attitudes without associated opportunities and skills are of no significance to the behaviour of others.

If the preferred interpretation of these results is satisfactory, then we cannot claim to have done much more than substantiate what mythical commonsense would have told us before we set out. However, it is doubtful that adult answerers of children's questions, be they teachers or mothers, observe the principles as much as they might.

4.1.2 Children's Questions and Mothers' Answers : Study II

Our follow-up of this study was instituted to examine this question-answer exchange further. How do aspects of maternal answering relate both to children's questioning and to their answering? Can we build up a portrait of the strategies which optimise the child's development? Following upon the last study and the arguments advanced in chapter 2 (section 2.7.4), we had to expect that LWC children would ask fewer questions of a more elementary nature (concrete, perceptual attributes, simple structure) and offer less knowledge in their answers.

Method

Subjects. The school at which arrangements were made was able to furnish only UWC children in sufficient numbers and of such ability for matches with MC children to be feasible. Ten UWC boys and ten girls were interviewed with their mothers and were then given Raven's Progressive Matrices. A predominantly MC school was then contacted and ten MC boys and ten MC girls were selected on Raven's Progressive Matrices to give matched groups (not pairs). They were then interviewed with their mothers. Refusals were few, co-operation warm.

Materials. A model Cash Register containing new and old money was selected because the new coinage had just been introduced and was therefore topical. Pairs of objects (Avocado pear, banana; eggtimer sandglass, pinger; African drum, football rattle; tin of baked beans, tin of bean sprouts; Cheddar and Emmenthal cheese; horse chestnut conker, cedar cone) were used to encourage the mothers to make comparisons, both of similarity and difference. One of each pair was assumed to be familiar to all, the other less so. A large colourful picture depicted characters from some nine nursery rhymes, each playing some characteristic aspect of their appointed roles. It was expected that all children would be acquainted with a sufficient number of these to make it viable as a discussion object, and that they would be sufficiently unfamiliar with others for there to be gaps in their knowledge that their questions might attempt to fill. The original Question/Answer game we had in mind proved unviable. In the end we had a set of questions which we first asked children and then tried to get them to refer on to their mothers.

The foregoing objects and activities were not intended to be such that MC children and mothers would be more familiar with them, but we included a Family Allowance Book as something more likely to make a weekly and significant appearance in WC than MC families, and a Bingo Card as a WC rather than a MC leisure pursuit. The Coloured Progressive Matrices of Raven were used to provide intelligence test scores.

Procedure. The precise procedure is described in our extended account (Robinson & Arnold, 1973), and since the details differed for each task, a summary is best made by reference to the principles rather than the specifics of the administration. The interviewer's first problem was to prevent the development of an atmosphere of 'formal testing' for either child or mother. The project was presented as an enquiry into the sorts of questions children ask and their reasons for asking them and this was justified in terms of the knowledge being of possible value in rendering school work both more interesting and productive. After a preamble that funnelled down to the specific tasks, certain rules governed the administration: a natural and easy flow of speech and activity was the primary goal; children were encouraged to say what they knew and to play with the objects; they were told to direct questions they had to their mothers. The interviewer intervened only when necessary. A final set of demographic questions was posed to mothers. All speech was recorded and notes were made of relevant non-verbal acts.

Treatment of Results. Speech was transcribed and the incidence of relevant categories noted for both mothers and children. In view of the nature of the scoring categories and the wide variation in their incidence of occurrence, non-parametric statistics were used.

Results

Children's Questions. While there were no social class differences in the number of questions asked by children overall, the questions of the MC children were more complex, more varied and longer. Analysis for each task separately showed up nothing more of major interest.

Children's Statements. MC children uttered more task-related statements, were more likely to answer questions addressed to them by their mothers, and were more likely to confess their ignorance on the Cash Register topic. Confessions of ignorance, total output, correct labelling, and 'other comments' were more frequent among them on the Pairs of Objects task. In the Answering Questions, they gave fewer disjointed and only weakly semantically associated answers and more appropriate answers. To the Nursery Rhyme picture they uttered more words and indulged in more specific labelling. On two tasks they used more tokens of uncertainty.

This greater display of knowledge by the MC children did not occur for the Bingo Card and Family Allowance book; the trend was in the reverse direction.

Mothers' Behaviour. Analyses were conducted within and not across tasks, but with the exceptions to be mentioned, the following differences were found. MC mothers were more generous in their provision of cognitive meaning; they made more informative statements and these were more likely to be related to the child's previous experience, more likely to extend his knowledge and interest, and more likely to involve comparisons. They posed more questions to their children. They provided more correcting and encouraging feedback. They were more likely to maintain a theme for more than four utterances. UWC mothers were more likely simply to repeat things their children had said, and their children were more likely to echo their mother's remarks.

With the Bingo Card and Family Allowance Books, however, UWC mothers offered children more cognitive meaning through informative statements than did MC mothers.

Relationships between Behaviour of Mothers and Children. For both MC and UWC child/mother pairs separately and for the total sample, there were significant correlations between children's statements and children's questions on the one hand and a summary index of mothers' provision of cognitive meaning, corrective feedback and encouraging feedback. For children's questions the correlation overall was 0.69 ($N = 40, p < .001$), for statements it was 0.67 ($N = 40, p < .001$). Question-asking by mothers was not associated with the questions and statements of their children.

Evaluation and Conclusions

Although the results obtained testify to the usefulness of the coding categories used and the theoretical framework underlying them, there are both procedural and theoretical worries outstanding.

Our decision to include 'working class materials' answers some questions, but poses others. A detailed inspection of results showed that UWC mothers provided more information for their children on these tasks than did MC mothers. However, there was no evidence of a difference in the two other aspects of 'provision of cognitive meaning', the setting in past experience and the extension beyond the present question. For 'asking questions of the child', the general class differences were preserved. Our weak conclusion must be that certain class differences in mothers' interactions with their children are topic-independent, but that others are not; one instance of the latter is that where knowledge is available and its transmission deemed appropriate, it will be provided by UWC mothers. Clearly, what is needed is a specific attack on this problem, possibly involving differential and systematic teaching of knowledge to mothers followed by an examination of their teaching and its efficacy. From the point of view of this problem the weakness of the Hess and Shipman study (1967) lay in their reliance upon only two simple tasks both of which had a middle class flavour, while the weakness here lies in not testing mothers for their knowledge and attitudes before we looked at what they passed on to their children.

Another procedural worry was our decision to meet deadlines by continuing with an upper working class sample rather than by hunting out the lower working class. We also failed to control intelligence test scores as closely as we would have wished and although the inter-group differences were non-significant, such variation in scores was adding to within-group variance on other comparisons. In particular, it is unclear how far social class differences in socialisation practices need to be analysed separately for each sex.

Our results did fail to confirm our main prediction of a lower rate of questioning among WC children. We have no ready answer. An argument that this was because we had UWC rather than LWC mothers and children cannot be sustained because we did find some of the social class differences in maternal behaviour that were thought to be relevant to the development and maintenance of curiosity in children as expressed in questioning, and the social psychological analysis gave high correlations (substantially higher than we would have expected). Inspection of individual protocols of children revealed very wide individual differences; four children asked two or fewer questions four asked more than forty. Two WC boys were very high on questioning, the only MC child who was very low was not so much incurious as very withdrawn. A different task might point to differentials in knowledge about the topics; because MC children knew more about the topics, there were fewer features for them to ask questions about? It might be the case that the curiosity of children is relatively resilient to inadequate answers, but that the long-term effects of differential provision of knowledge and feedback will result in a lower curiosity among WC children. However, this was not apparent here.

If these weaknesses reduced the value of the results at a sociological level of analysis, they were not relevant to the very strong associations between the behaviour of mothers and children at the social psychological level. Here the results were impressive. Although there were social class differences in mothers' behaviour, but not in the number of questions asked by their children, these two were highly correlated with each other in the class-independent correlational analysis. The failure of maternal question-asking to relate to the children's behaviour helps to bring differentiation into the situation and the present preferred interpretation would be as follows: 'the development of children's knowledge is achieved by 'pulling' rather than 'pushing' '. If we conceive of the mother as an initiator of activity and as a source of knowledge that can be tapped, it is the latter role which is relevant to the child's acquisition of knowledge. The categories of maternal behaviour relevant to the child's knowledge and questions were those that allowed the child to decide what to do with it, although knowledge was also made assimilable by relating it to past experience, its production by the child was met with correction or confirmation, and it was extended. Maternal pushing and testing did not relate to the children's behaviour. This is not to say that mothers cannot engage the interest of their children is one activity rather than another, but it does make it seem likely that although mothers may be able to lead them there, the children decide what to drink.

Educational Implications

Cursorily we may remind ourselves that in these investigations the 'attitude' measures provided much weaker correlates of children's behaviour than did the reports and observations of what mothers did. By analogy, studies of classroom interaction would be expected to relate more closely to pupil behaviour than would measures of the attitudes of teachers.

Social class acted as a strong separator of both mothers and children along the lines anticipated for the quality of questions and quantity of statements offered by children and the strategies and tactics adopted by mothers. The single exception is theoretically awkward, but socially reassuring. The number of questions children asked was unrelated to social class, as in Heber's study (1972). Although this is inconsistent with the specific predictions made, it is not immediately damaging to the cognitive developmental/reinforcement amalgam proposed as a model of child development. We could suggest that the intrinsic motivational factors were still strong enough to be uninfluenced by the reinforcement schedules believed to exist in WC homes. While a wish to conform to the demands of the experimenter may have been a factor in Heber's investigation, there was no sign of its intrusion into ours. Our children were UWC rather than LWC. As far as educational practice is concerned, we are forced to conclude, pro tem, that there are no social class differences in the propensity to ask questions at age seven; the value of relying on intrinsic motivation to help children learn can be treated as class independent.

Noting the close associations between certain aspects of the mothers' behaviour and the children's questioning and answering we might ask how far teachers' strategies approach optimal learning opportunities. The situations differ in important ways, but it may be helpful to point to the apparent irrelevance of the mothers' questioning. A high incidence of maternal questioning was not associated with the children's behaviour. We cannot be sure of the intention of the mothers in asking questions in our situation, one presumably was to draw attention, another to excite curiosity, a third to check what the children knew. Without further and finer analysis we must be careful in drawing conclusions, but we can ask about the high incidence of the teachers' questions in classrooms.

Firstly, in a pilot study Barnes (1966) found that factual questions from teachers outnumbered reasoning questions by four to one. With a topic controlled set of lessons in fifteen schools using tenth and twelth grade pupils, Bellak, Khebard, Hyman & Smith (1966) found that forty seven per cent of the teachers' acts were 'solicitations' (most commonly questions and commands) and thirty per cent were 'reactions' to the pupils' responses. That is, over eighty per cent of acts centred around question, answer, evaluation episodes. Even at this late stage, only eleven per cent of the pupils' behaviour was made up of 'solicitations'.

Does this very high incidence of teacher questioning have an educational value? Or rather, does it have as much or more than alternative activities? Certainly the differences between classrooms and kitchens should not be underestimated. Children at home do not need to be kept awake by the possibility of a question coming their way, neither do other children generally have the benefit or otherwise from hearing their replies. But the critical question of the relationship between teachers' questions and pupils' learning is an empirical issue that ought to be investigated in natural settings. We ask about questions as an aid to learning in chapter 9, but this was within constraints not normally operative in the classroom.

In the meantime we can argue that answers to questions, which relate this answer to the past experience of the child, that not only answer the question posed, but go beyond it, that move towards explanation in terms of principles and processes are associated with a higher incidence and greater complexity of children's questions. Correction and encouragement of children's statements was positively associated with both questioning and knowledge exhibited by the children.

As we remarked at the end of the section devoted to Study I, the nature of these results may not cause great surprise, but are these principles applied in our interactions with other people, in particular when we are in a teaching role?

4.2 A Week-end of Cross-Cultural Studies

Introduction

The Newsom Group adviser of the LEA and the headmaster of a local neighbourhood comprehensive school arranged for about thirty fifth formers to spend a week-end in a country YMCA centre at which they were to see films, hear lectures and have discussions about race, culture, and custom. There were recreational facilities available, and for many of the group there was an additional novelty in that this was the first time they had spent a night away from home, so that they were experiencing more than a crash course in cross-cultural psychology. We were, however, hoping to evaluate the effects of the week-end and on a quid pro quo basis this evaluation took on a dual aspect. Firstly, did the participants change their attitudes to ethnic groups other than their own, and if so, who changed how much in what direction? Secondly, on the curiosity side, were 'curious' pupils more likely to participate than non-curious ones, and was curiosity about other people increased by the experience? If there were individual differences in these respects, of what kind were they?

Screening instruments were given to the whole fifth form by the Schools Council project workers some six weeks before the weekend, and this procedure was repeated about four weeks after it had taken place, with only one additional instrument. There were features of the experimental design and procedures that would not be pleasing to a critical laboratory-based investigator, but this is an almost inevitable cost to be incurred if the compensatory benefits of natural situations are to be obtained.

The pupils attending the course were volunteers, their motives for attendance probably mixed and left unquestioned. Whether or not they differed from non-attenders on the measures taken is examined in the results. We were in fact interested to see both whether they were more favourably disposed to out-groups and whether they were more curious than the non-participants. By taking pre-and post-experience measures, we were able to see what effects if any the week-end course had, in particular whether attitudes and curiosity had changed.

Brief description of course. The intention of the organisers was to encourage a quietly enthusiastic ambiance and this was achieved as far as one could judge. Of three well-spaced lecture sessions, one on problems and rules in two-person face-to-face encounters involved demonstrations and acted examples, another by Roy Sawh was delivered with considerable vivacity, while the third session was of three short personal experiences of being at the receiving end of racial discrimination. One film showed life among the Masai, the second gave Dr. Benjamin Spock's views about the development of prejudice. This latter film was an annoying mess of inaccurate 'facts' put over in an authoritarian rather than authoritative manner. For example, it asserted that prejudice was a disease children catch from their parents! The pupils formed groups to discuss the films and lectures; with the help of tutors. Five folders had been prepared, which, in conjunction with magazines made available, were for each group to produce a report to be retailed to the others. Although the course surveyed the whole field of similarities and differences across ethnic groups, there was a clear emphasis on problems of conflict, particularly where this was associated with racial discrimination.

Hypotheses. The dual set of interests in the study cause some complications in writing-up, and if there had only been one focus of inquiry, rather different measuring instruments and procedures would have been selected. However, we attempted to interpret behaviour towards out-groups in such a way that an integration was feasible.

If we assume some kind of dimension of friendliness – indifference – hostility, we can ask whether these values of that dimension involve approach to or avoidance of the relevant objects. Both friendliness and active hostility appear to imply approach, indifference does not not. In a society where it is a criminal offence to assault other people and the law is enforced however, we might expect hostility to be generally associated with avoidance rather than approach. If 'prejudice' often has the dynamics attributed to it by enthusiasts of the 'scapegoat theory' of prejudice (see Brown, 1965), there are additional reasons for avoiding contact with disliked out groups, *e.g.* they may be found not to have the characteristics projected onto them. Hence, appearances may be deceiving, and in the present context we might find both indifference and hostility associated with avoidance rather than approach. Assuming this to be a reasonable inference, we decided to ask subjects about their willingness to meet and interact with members of an ethnic out-group, one of the groups they were in fact most likely to encounter. An instrument which began with 'Say an Indian family moved in to live next door to you . . .' and was followed by a series of questions about likely reactions provided the main source of information about lack of friendliness to out-groups. The subjects received this as the final questionnaire on the second testing only. On both occasions, there was a single item about enthusiasm for spending a fortnight with a Persian family. With these as direct criterion measures of dispositions towards out-groups, one set of our problems was to relate individual differences on these scores to other attitudes and behaviour, in terms of both likelihood of attending the week-end course and differential responsiveness among those who did attend.

Of several possible covariants, seven were selected for investigation: adventurousness, specific and general curiosity, beliefs about the friendliness-unfriendliness of other people, fatalism, authoritarianism, and conformity to group norms.

To be unenthusiastic about meeting members of another cultural group might simply reflect a general lack of interest in novel and possibly frightening pursuits. Those who are least likely to wish to climb mountains or drive racing cars may be less unenthusiastic about meeting strangers. Hence, an 'adventurousness' questionnaire (Q. Adv.) was constructed.

To wish to find out by experience may be independent of a wish to find out in other ways. People may exhibit curiosity by reading, asking and means other than direct interaction, and inversely a lack of curiosity without interaction is unlikely to be associated with a wish to meet. Such an absence of curiosity could be specific to members of cultural out-groups, but it could have generality across other people and their institutions and organisations. To examine this possibility children were asked what questions they had about a number of topics directly or indirectly associated with other cultures (Q. Qu.).

Two other types of reasons for indifference or hostility to out-groups are within the compass of a single questionnaire designed by Rotter (1966). This questionnaire attempts to expose variation among individuals in the extent to which they see themselves as having control over what happens to them, with particular reference to unpleasant and pleasant experiences. Is it luck, chance, fate that controls one's destiny or one's own actions? Possession of a relatively fatalistic outlook is unlikely to be associated with active exploration of the environment (Q. Fate). Two items on this questionnaire are specifically concerned with the perceived hostility-friendliness of other people, and here a belief in general unfriendliness is likely to be predictive of indifference or hostility to out-groups (Q. Hos.).

While beliefs of these types are not particularly associated with the commonly offered explanations of 'prejudice', the final belief system we measured was the one most widely investigated, namely: 'authoritarianism'. In spite of the forceful methodological and theoretical criticisms that have been made of the 'The Authoritarian Personality' (Adorno, Frankel-Brunswik, Levinson and Sanford, 1950) several of their basic propositions seem to be established. People who are anti-semitic tend to be xenophobic, politically and economically conservative and authoritarian. Authoritarianism is conceived as a dimension, one end of which is defined by a use of clear-cut and rigid categories of events, objects and people, an expressed wish for a well-ordered world preferably organised with a hierarchical structure in which everybody knows his place. Associated with this concern for order are beliefs that order is chronically threatened by powerful evil forces which are best contained by violent means regardless of whether these threats arise within a society in the guise of crime and deviance or from outside it through the predatory behaviour of another nation. The belief system is not necessarily internally consistent but its constituents are held rigidly. The syndrome is held to arise from chronic frustration through early childhood, in particular from a punitive control of aggressive and sexual responses. Adaptation is achieved via the defensive mechanisms of repression, displacement and projection. One aspect of this constellation is hostility to out-groups. If this account has validity then highly authoritarian subjects assessed on the F-scale (Fascism, Q. Fas.) should be less likely to attend the course and less likely to change their attitudes if they do.

The possible sources of influence mentioned so far have all focused on the individual and his dispositions and beliefs; none of them are social psychological. However, we are influenced by the norms of the groups of which we are members and one obvious source of influence for secondary school pupils is their peer group. Could indifference and hostility to out-groups be an example of conformity to group norms? While the problems of explaining why some individuals are more influenced than others by the norms of their peer group and why the norms are as they are would require further explanation, the existence of a group norm and subscription to it could be a first-order explanation of why individual group members hold certain beliefs. Hodgins (1969) developed a multiple-choice questionnaire for the study of relationships of sociometric status to knowledge and conformity to the norms of various reference groups. The systematic procedures adopted to construct her questionnaire and the meaningful results it helped to generate encourage a willingness to treat scores on it as reliable and valid measures of a propensity to follow group norms in a number of social situations. Without advance knowledge of the group norm towards out-groups we cannot predict in advance what their relevance will be to likely changes in attitudes to out-groups, but this could be achieved after initial calculations (Q. Norm).

This battery of questionnaires made up our armoury of evaluative instruments, both for the examination of differences between course participants and others and for the examination of any differential change among the participants — *viz. a viz.* hostility and indifference to ethnic out-groups.

Scores on these questionnaires and the course experience might also be expected to relate to questioning behaviour, but such expectations would not merit any status higher than that of 'hunch'. If other people are seen as basically friendly this is more likely to be conducive to active exploration of the environment and hence questions about it (Q. Hos.), while the belief that one has power to control the environment should likewise be indicative of a concern for knowledge to control it (Q. Fate). Adventurousness in general might be exemplified by curiosity in terms of numbers of questions (Q. Adv.). High F scale scorers have too many dark hidden corners and cognitive inconsistencies to make question-asking and answering safe and enjoyable. Conformity is an unknown quantity.

While those volunteering for the course might perhaps have more questions at the outset, one would expect this number to increase if the course has been successful. The ideas of Ausubel (1968) and Robinson and Rackstraw (1972) imply that for questions to arise presuppose some framework of knowledge — with a gap of gaps in it. A question cannot arise in a void in so far as the week-end course acquainted the participants with knowledge and ideas, the possibility of questions is increased. In so far as interest in cross-cultural studies has been aroused, questions should have increased.

Method

Design. Several ways of analysing the data were available. The participants in the week-end can be treated as the Experimental Group (E) on whom one has measures prior to the course. Non-participants are treated as a Control Group (C). Comparisons between Groups E and C at t_1 show up whether or not volunteering is associated with more 'friendliness' and curiosity. Comparisons within Group E (GpE, t_2—GpE, t_1) show what changes the course has effected, if any, while a demonstration that GpC, t_2 makes similar scores to GpC, t_1 strengthens one's belief that the course rather than external unknown events are responsible for the changes.

Subjects. All the fifth form pupils at a creamed comprehensive school took part. Many were CSE candidates. With some loss from absences at t_1 and t_2, fifty six pupils were involved, five boys and nineteen girls in Group E and fifteen boys and seventeen girls in Group C.

Materials. The full questionnaires are relegated to Appendix I. The questionnaire on adventurousness (Q. Adv.) and the topics for questions (Q. Qu.) were made up, the F-scale (Q. Fas.) was from Adorno *et al.* (1950), the conformity to group norms questionnaire (Q. Norm) was from Hodgins (1969) and Rotter's I-E Scale (1966) adapted to give measures of fatalism (Q. Fate) and hostility to members of out-groups (Q. Hos.). The questionnaire about reactions to an Indian family moving in next door used only on the second administration was also made up (Q. Ind).

Procedure. Fifth formers were given the following instructions prior to completing the questionnaires: 'We are at the University trying to find out what people of your age think and feel about a variety of things. The only way we can find out is to talk with you and ask you to answer questions. What we'd like you to do is fill in the forms in front of you. It tells you what to do at the top of each one, but if there is anything you don't understand or can't follow, please ask and we'll help you. This isn't a test. There are no right or wrong answers and this has nothing to do with the school. None of the teachers will see anything you write. We'll have half an hour on this and then there is something else for the rest of the time'.

The pupils then completed Q. Fate, Q. Hos., Q. Norm, Q. Adv., and Q. Fas..

With these questions answered, the second set of instructions was given: 'On these sheets are the names of places and people that are often mentioned on the news and in the papers. What we'd like to know is what you want to know about those we have picked out. There may be things you don't know about them that you would like to know. Can you write any questions you have about each under the headings? If you like, later this term, we will come back and answer some of the ones you ask. We will have three minutes for each heading. I'll tell you when it's time to go on'. These headings appeared on each foolscap sheet: India, John Lennon, Russians; Pakistanis, The British Empire, Hippies; Biafrans.

This procedure was followed by pairs of research workers in each of the three classes. For the second administration, identical instructions were given except that a justification was given of the repetition; the pupils being told about problems of consistency and stability in the social sciences, and the need of research workers to check their data for these features. This was only stated after the pupils had filled in the questionnaires. At the beginning they were assured that we had good reasons which would be conveyed to them afterwards. The second administration included an extra item about their likely response to an Indian family moving in to live next door to them (Appendix I).

As far as the pupils were concerned there was no connection between the completion of the two sets of questionnaires and the week-end course until a final de-breifing at which the total design was exposed. At these sessions no pupils mentioned having drawn the right conclusion at an earlier point in time. It is customary to claim that investigations were conducted in friendly atmospheres *etc.*. This claim could be strengthened in this instance by pointing out that Robinson was helping various boys and girls with CSE sociology projects and had shown pupils round the Psychology Department of the University.

Treatment of Results. With only five boys in the experimental group we decided to confine our analysis to girls. This is not inconsistent with decisions taken in other studies where social class comparisons are sometimes based on very small numbers. In those studies, flexible individual interviews rather than group administered structured questionnaires were used.

Certain preliminary steps had to be taken before data could be processed. Item 9 on Q. Fate which contrasted 'life being O.K. *(their phrase not ours)* as it is with life being better if what we ought to do were more precisely specified' seemed to be different in substance from most of the other Q. Fate items; it does not contrast fate with personal control and responsibility. It was dropped. Items 3 and 7 were scored 1 for the hostile and 0 for the friendly choice and added together to give Q. Hos. Fatalistic choices on all other items were scored 1 to give a Q. Fate score.

To obtain a measure of conformity to group norms and therefore presumed concern with these, a count was made of all choices of each option for all girls on Q. Norm. Clear preferences for one category were shown for six of the seven items; the first having two main choices. These options were taken as norms and each girl was given a score of 1 for each choice of a norm, giving a possible score of 7.

The actual choices were:

1.	d and e — laugh or ignore (after being tripped at hockey)	55%
2.	b — laugh it off (when laughed at by others)	64%
3.	a — apologise (for falling on someone on a bus)	69%
4.	b — go to her house (for a borrowed record)	42%
5.	d — jokingly tell her to shut up (for talking in class)	52%
6.	a — correct here (for lying)	44%
7.	e — find proof (to show self right about a fact)	58%

For Q. Adv. score item 4 was not included because it referred to a racial matter.

The five items on the questionnaire about reactions to the arrival of an Indian family next door were intercorrelated and the general positive flavour of the matrix was used to justify a simple summary score (see Table 4.3.1.) Each item was scored 3 for the most 'friendly response', 2, 1, 0 for the successively less 'friendly' ones.

Table 4.2.1. Inter-item Correlations for 'Friendliness' to Indian Peer Living Nextdoor (N = 32)

		2	3	4	5
1.	Wanting to get to know	24	37*	37*	32
2.	Expecting to get to know	x	55**	04	23
3.	Expecting to make friends		x	12	42*
4.	Expecting friends to accept			x	40*
5.	Visiting house				x

* means p < .05, ** means p < .01

Below Q. Ind. was half a page headed 'If you went around with her (Indian Peer) do you think you would meet any difficulties? Write down the difficulties you might have, if any'. Difficulties were counted. They were also classified, but the incidence of occurrence was too low overall for this to be useful.

The questions were counted and classified for each topic, although only those about India, Pakistanis, Russians and Biafrans were in fact used. Five attributes of questions were recorded:

1. *Hostile:* Any question with an explicit derogatory premiss.
2. *Ethnocentric:* Any question that was posed *either* from a British perspective *or* assumed that some British custom was more natural or proper.
3. *General:* Any question that assumed that a single attribute could be applied to all members of the group identified.
4. *Simple Genuine:* A request for information rather than an implicit protest.
5. *Informed:* A question could contain accurate knowledge about the topic.
6. *Cultural:* Where the question did not focus on a particular person or a war *etc.,* but asked about the cultural norms and problems and resources of that culture, this category was scored.

Results.

Reliability of Instruments. To cut down on the number of calculations to be performed (and the complexity of the write-up), we combined the experimental and control gorups of girls and correlated scores at t_1 with those at t_2. Any differential change in the groups would therefore lead to underestimations of reliability. All correlations were significant and all except that for the two items Q. Hos. indicated a fair measure of stability: Q. Fate, $r = .70$, $p < .005$; Q. Hos., $r = .30$, $p < .05$; Q. Norm, $r = .54$, $p < .005$; Q. Adv. (– item 4), $r = .65$, $p < .005$; Q. Fas., $r = .62$, $p < .005$ ($N = 32$).

With these consistencies established we can enquire into the antecedents and correlations of both friendliness and other ethnic groups and variations in the rate and types of questions.

Friendliness to Other Ethnic Groups

Pre-course Differences between Experimental and Control Groups. Only one instrument showed up a difference: Group E was more fatalistic than Group C ($\overline{X}E = 4.67$, $\overline{X}C = 3.5$; $U = 63$, $z = 2.12$, $p = .034$). That this was not a freak result is supported by the finding that this same difference emerged in the post-test measures. Neither the questions Q. Qu. nor the willingness to stay with a Persian family showed differences.

Changes between Pre- and Post-course Measures. It was suggested in the introduction that two comparisons might be made in responses; both $Et_2 - Et_1$ and $Et_2 - Ct_2$ allowed estimates of course effectiveness. To simplify the comparative process a third combinatory tactic was used; namely $\Sigma(Et_2 - t_1) - \Sigma(Ct_2 - t_1)$. That is, each person's difference score was calculated. None of the questionnaires yielded any differential change. Q. Adv. showed nine Group E, but only four Group C girls becoming more adventurous ($X^2 = 1.32$, N.S.). Since forty seven per cent of the girls were already happy to stay for a fortnight with a Persian family on the first administration, to have expected any differential change on this single item would have been overly optimistic.

On the post-test measure of approach to the Indian family next door Group E girls were more 'friendly' than those of Group C ($\bar{X}E = 1.6$, $\bar{X}C = 1.16$; $U = 69$, $z = 2.21$, $p = .027$). Group E also foresaw more difficulties in being 'friendly' ($\bar{X}E = 1.3$, $\bar{X}C = 0.3$; $U = 79.5$, $z = 2.22$, $p = .026$).

These results encouraged us to believe that the course had indeed had some effect, but perhaps we could go further and find out who in Group E had been most susceptible to change. Accordingly, scores on each of the questionnaires were divided into high and low sets, high being defined as above a cut-off level which included fifty per cent or fewer of the sample. The question was then posed as to whether these groups differed in their responses on Q. Ind.

Q. Fate, Q. Norm and Q. Fas. were not associated with Q. Ind., but those girls who made low scores on Q. Hos. were more friendly on Q. Ind. than those who made high ones ($U = 10$, $n_1 = 5$, $n_2 = 12$, $p < .05$), while those high on Q. Adv. were more friendly ($U = 14$, $n_1 = 8$, $n_2 = 9$, $p < .05$). In Group C only Q. Adv. began to be associated with Q. Ind. ($U = 11.5$; for $U = 11.5$, $p < .05$).

Questions

The numbers of questions asked about India, Russians, Pakistanis and Biafrans on the two occasions were similar ($r=0.63$, $N = 32$, $p < .005$), and there was likewise a general though weaker consistency across the four topics, girls who asked more about one topic asking more about other topics (see Table 4.2.2.).

When we sought for associations between these scores and others our initial optimism quickly flagged. As table 4.2.3. shows there was no difference between Group E and C prior to the week-end course.

Table 4.2.2. Rank Order Correlations between Number of Questions asked about Four Topics (N = 32).

	Topics			
	Biafrans	Pakistanis	India	Russians
Biafrans	x			
Pakistanis	.14	x		
India	49*	.42*	x	
Russians	.60**	.37*	.38*	x

* means $p < .05$, ** means $p < .01$

More discouraging there was no difference between the groups after the course and no suggestion of an increase in Group E through time.

Individual differences on two questionnaires related somewhat weakly to questioning. Q. Adv. did not, but 'friendliness to the Indian family' did ($U = 78$, $n_1 = 15$, $n_2 = 17$, $z = 1.90$, $p = .057$) as did independence from group norms ($U = 61$, $n_1 = 15$, $n_2 = 17$, $p < .02$).

This unimpressive array could not be improved by eliminating various odd categories of question from the total count.

Table 4.2.3. Mean Numbers of Types of Question as a Function Participation on a Week-end Course

Group/Time	Type of Question Hostile	Ethno-centric	General	Simple Genuine	Informed	Cultural	Total
Experimental t_1	0.6	3.2	1.4	6.9	2.5	5.7	8.2
Experimental t_2	0.2	2.9	1.3	7.0	2.5	5.6	7.8
Control t_1	0,2	2.9	0.9	8.1	2.3	6.0	8.3
Control t_2	0.4	2.0	1.1	6.7	2.7	5.3	7.3
Experimental Total	0.8	6.1	2.7	13.9	5.0	11.3	16.0
Control Total	0.6	4.9	2.0	14.8	5.0	11.3	15.6
Time_1 Total	0.8	6.1	2.3	15.0	4.8	11.7	16.5
Time_2 Total	0.6	4.9	2.4	13.7	5.2	10.9	15.1

Lenore Abramsky made the helpful observation that the mass-media may have been relevant to some of the variations in the types of question asked. For example, questions about Biafrans were almost wholly sympathetic, reflecting the bias of the media at the time — the war was still in progress. By contrast the questions about Pakistanis reflected the views of anti-immigration politicians which were currently receiving wide coverage in the press and on television.

Discussion

As far as the main manifest objectives of the course were concerned, the organisers can be reassured of the worthwhileness of their investment. Six weeks after attending the course, girls expressed a greater willingness and enthusiasm for interacting with Indian neighbours than did girls who had not participated in the activities. That they were also aware of more difficulties in the interaction substantiates the idea of the course having been informative. This is not the whole story, because it was possible to add that those girls who viewed human nature as beneficient (Q. Hos.) and were more generally adventurous (Q. Adv.) were the ones most favourably disposed to interact, Since neither of these questionnaires related to variations on Q. Ind. in the control group, the most simple interpretation would be that the course shifted the willingness of those already predisposed to be friendly. Just having the disposition and adventurousness are insufficient on their own; the course was least effective for those who were more hostile and less adventurous. All three were necessary, no one sufficient, to produce a change.

The failure of the more general attitude questionnaires (Q. Fate and Q. Fas.) to predict change or reflect may be a consequence of their greater generality. Reflecting philosophies of life as they do, it is a little optimistic to expect change in two days! In the introduction we equivocated about the relevance of peer groups norms to hostility to other ethnic groups. Since such scores were unrelated either to individual variation or change, it might be safe to conclude that there is no strong peer group norm demanding either acceptance or rejection of other ethnic groups.

While the LEA can be satisfied, the Schools Council Project cannot. Although the questioning was stable across topics and time, we were not able to specify correlates. The course did not succeed in stimulating interest and curiosity manifested in the number or type of questions asked.

Neither did total questions, informed questions or genuine questions relate to individual differences on Rotter's IE Scale or the F scale. Expectations that fatalistic or authoritarian world-views would inhibit questioning were not fulfilled. General adventurousness was not reflected in wanting to know more about peoples and countries, although for reasons unknown, the expressed willingness to interact with an Indian neighbour was. One interpretation of the relationship between independence of group norms and questioning would be that there is a norm which requires some optimal minimisation of productivity in classrooms, so that only those who were uninfluenced by this felt free to write more questions. Another possibility would be that those who ask more questions are more likely to have questioned and then rejected the basis of peer group constraints upon behaviour; they are more likely to have thought things out for themselves.

The failure of the attitude questionnaires in this study is reminiscent of their weakness in the study of mothers (section 4.6.1.) and reinforces the idea mentioned there that they are too general and distal from immediate behaviour to have simple predictive power.

4.2 Appendix

(Q. Fate, Q. Hos.)

Tick only one box for each pair of sentences and tick the one you think is nearest to the truth.

		Tick in box
1a	Many of the unhappy things in people's lives are mainly due to bad luck.	☐
b	People's troubles are usually a result of their own mistakes	☐
2a	One reason we have wars is because people don't take enough interest in politics.	☐
b	There will always be wars no matter how hard people try to prevent them.	☐
3a	You can trust most people if you are in trouble.	☐
b	It's safer not to have to rely on other people.	☐
4a	In the long run people get the respect they deserve.	☐
b	A person's worth often passes unnoticed no matter how hard he tries.	☐
5a	There's a lot of chance in the exam marks pupils get.	☐
b	Teachers generally try to be fair in marking exams.	☐
6a	People who don't make friends just haven't learned how to.	☐
b	No matter how hard you try, some people just don't like you.	☐
7a	People over most of the world are basically friendly.	☐
b	Most people will do you down if they get a chance.	☐
8a	Fortune tellers can see into the future.	☐
b	Horoscopes are a load of nonsense.	☐
9a	Life is O.K. as it is.	☐
b	It would be better if we were quite sure what we ought to do.	☐
10a	In the long run the bad things that happen to us are balanced by the good.	☐
b	Most misfortunes are a result of lack of ability, ignorance, laziness or all three.	☐
11a	Success is a matter of ability and hard work. Luck has little to do with it.	☐
b	Getting a good job depends mainly on being in the right place at the right time.	☐
12a	Human nature can't be changed.	☐
b	What we are like depends upon how we are treated.	☐

(Q. Norm).

Where words are in brackets these are for girls. It saves work not to write out one set for boys and one for girls!

These seven items have to do with things that might well happen to Vth formers like yourselves. Your job is to tick the thing that you think you would do. You have a choice of *five* answers, but you must choose only *one*. If none of the five fits and there's something else you would do, write it out beside f) other . . . . If you don't understand please ask.

1. You are playing soccer (hockey) with a group of friends. It is a friendly game. One of your mates trips you up on purpose as a joke. He (she) laughs. What would you most likely do?

   a) swear
   b) trip him (her) later
   c) hit him (her)
   d) laugh
   e) carry on playing
   f) other . . . . . .

2. As you are walking into the classroom one morning, you stumble on the leg of a desk and fall. Several other boys and girls in the room see you fall. The teacher is not there. What would you most likely do?

   a) make a smart remark
   b) make a joke out of it
   c) swear
   d) kick the desk
   e) carry on to your desk
   f) other . . . . . .

3. You are standing in a very crowded bus. Suddenly it stops and you fall into the lap of a middle-aged woman. What would you most likely do?

   a) apologise
   b) laugh
   c) leave the bus
   d) walk away
   e) ask if you had hurt her
   f) other . . . . . .

4. A casual friend borrowed your favourite record. After three weeks he (she) still has not returned it, even though you have reminded him (her) several times. What would you most likely do?

   a) threaten him (her)
   b) go to his (her) house
   c) ask him (her) again
   d) make up a reason why you need it
   e) tell him (her) to give it back
   f) other . . . . . .

5. While studying in your classroom, the boy (girl) who sits next to you keeps disturbing you. He (she) never stops talking. The teacher is in the room. What would you most likely do?

   a) threaten him (her)
   b) ask the teacher if you can move
   c) hit him (her)
   d) jokingly tell him (her) to shut up
   e) tell him (her) to shut up
   f) other . . . . . .

6. You hear the form captain telling lies about your best friend to two other boys (girls) in your form. What would you most likely do?

   a) correct him (her)
   b) make a sarcastic remark
   c) tell your friend
   d) punch him in the mouth (slap her face)
   e) call him (her) a liar
   f) other . . . . . .

7. You are talking about motor cycles (hairdo's) with three casual friends. You make a point which you know is right, although they all disagree with you. What would you most likely do?

   a) agree with them
   b) tell them to shut up
   c) continue to argue
   d) forget it
   e) find proof
   f) other . . . . . .

(Q. Adv.)

Would you like to try out each of the following activities with help?
Put a tick in the box you feel is true for you.

	YES	?	NO
Exploring underground caves			
Training a lion to jump in a circus			
Getting to Scotland and back on 10 shillings			
Staying for a fortnight with a Persian family			
Cooking and eating an octopus			
Learning to fly a small plane			

(Q. Fas.)

1. Obedience and respect for authority are the most important virtues children should learn. YES/NO
2. A person who has bad manners, habits and breeding can hardly expect to get along with decent people. YES/NO
3. If people would talk less and work more, everybody would be better off. YES/NO
4. The businessman and the factory manager are much more important to society than the artist and the professor. YES/NO
5. Science has its place, but there are many important things that can never possibly be understood by the human mind. YES/NO
6. Young people sometimes get rebellious ideas, but as they grow up they ought to get over them and settle down. YES/NO
7. What this country needs most, more than laws and political programmes, is a few courageous, tireless, devoted leaders in whom the people can put their faith. YES/NO
8. No sane, normal, decent person could ever think of hurting a close friend or relative. YES/NO
9. Nobody ever learned anything really important except through suffering. YES/NO
10. What the youth needs is strict discipline, rugged determination, and the will to work and fight for family and country. YES/NO
11. An insult to our honour should always be punished. YES/NO
12. Sex crimes, such as rape and attacks on children, deserve more than mere imprisonment; such criminals ought to be publicly whipped or worse. YES/NO
13. There is hardly anything lower than a person who does not feel a great love, gratitude, and respect for his parents. YES/NO
14. Most of our social problems would be solved if we could somehow get rid of the immoral, crooked, and feeble-minded people. YES/NO
15. When a person has a problem or worry, it is best for him not to think about it, but to keep busy with more cheerful things. YES/NO
16. Every person should have complete faith in God whose decisions he obeys without question. YES/NO
17. People can be divided into two distinct classes: the weak and the strong. YES/NO
18. Some day it will probably be shown that the stars can explain a lot of things. YES/NO
19. Wars and social troubles may someday be ended by an earthquake or flood that will destroy the whole world. YES/NO
20. No weakness or difficulty can hold us back if we have enough willpower. YES/NO
21. Most people do not realise how much our lives are controlled by plots hatched in secret places. YES/NO
22. Human nature being what it is, there will always be war and conflict. YES/NO

23. Nowadays when so many different kinds of people move around and mix together so much, a person has to protect himself especially; carefully against catching an infection or disease from them. YES/NO

24. Nowadays more and more people are prying into matters that should remain personal and private. YES/NO

25. The wild sex life of the old Greeks and Romans was tame compared to some of the goings-on in this country, even in places where people might least expect it. YES/NO

(Q. Ind.)

Please tick your answer

Say an Indian family moved in to live next door to you and they had a boy/girl (boy for boys, girl for girls) of your age –

1. Would you like to get to know him/her?

   very much . . . . quite . . . . not very much . . . . not at all . . . .

2. Do you think you would get to know him/her very well?

   not all . . . . . . just to say hello . . . . . . not very well . . . . . . very well . . . . . .

3. Would you be likely to make friends?

   Close friends . . . . . . friends . . . . . . casual friends . . . . . . not at all . . . . . .

4. Would your friends accept him/her?

   not at all . . . . . . only slowly . . . . . . very soon . . . . . . immediately . . . . . .

5. Do you think you would visit his/her house?

   very seldom . . . . . . sometimes . . . . . . quite often . . . . . . often . . . . . .

If you went around with him/her do you think you would meet any difficulties? Write down the difficulties you might have, if any. (This instruction was followed by a six inch space.)

The items for questions (Q. Qu.) were in order: India, John Lennon, Russians, Pakistanis, The British Empire, Hippies, Biafrans. There was a three inch space for each.

4.3 Experience for a Week (C.D. Creed & W.P. Robinson)

Introduction

In his researches into the nature of curiosity, Berlyne (1960) suggests that the wide variety of stimuli that arouse curiosity behaviour have certain properties in common. These, it is argued, are typically not properties intrinsic to the stimuli themselves, but are relational properties existing between the stimuli and the attending organism. Berlyne used the phrase 'collative variables' as a generic term describing such relational stimulus-organism properties. Specifically, it is suggested that stimuli that arouse curiosity bear one or more of the following relationships to the organism: novelty; change; complexity; conflict; surprisingness; and uncertainty. We have reviewed work relevant to these issues in chapter 2.

However, collative variables as described could refer not only to specific, static, stimulus objects, but equally to aspects of activities that a person might perform, for activities may obviously vary in their novelty and complexity *etc.*, according to the nature and past experience of the person performing them.

It became possible to observe a group of school boys as they were exposed to and asked to perform a set of largely novel activities. It was felt that such observations could be useful since the factors associated with curiosity were closer to applied teaching problems than the bulk of the research literature in this area.

Method

A group of fifteen year old boys were given questionnaires before, during and after their exposure to several new sporting activities. These three questionnaires, substantially the same in each instance, asked for information about their interest, preferences for and perceptions of these various activities.

Subjects. Nineteen male, fifteen year old school children (age range: 14.4-16.3) were subjects in this investigation. They all came from the same secondary school. The school was situated in a predominantly working class area in an overspill housing estate just outside a large city. The subjects came from fourth and fifth year classes and had all volunteered to go on a residential activities course before they knew of any intervention or investigation. As far as the subjects were concerned the purpose of the questionnaires that they were asked to fill in was to give information about their likes and dislikes to the course organisers.

The Course. The five day course the boys attended was residential. Its purpose was to introduce them to a number of sporting activities that otherwise they would be unlikely to experience. The activities centre where this course was held was run and organised by the local education authority. The centre puts on different courses throughout each school team. Any group from any school under the education authority's jurisdiction may arrange to go on one of these courses. At the time our group was on the course no other groups from other schools were on the sporting activities course, and only one other group of children were there — a group taking a school leaver's course. Our group was introduced to and given instructions in the following sporting activities: rifle shooting, badminton, rock climbing, roller hockey, go-karting, archery, and orienteering.

The Questionnaires. (a) The first questionnaire was given before the course. The subjects ranked the seven sports with respect to the following three dimensions: expected enjoyment, expected skills needed, and the expected complexity of the rules of the sports. In addition they rated each sport on a five point scale (fun – boring); on a seven point scale for previous experience (never heard of it – done it often); on a five point scale of expected ability (very good – very bad); and on a five point scale whereby the subjects indicated how often they would like to do the sport in the future given that facilities were readily and costlessly available (never – more than once a week). As well as this, each subject wrote down all of the questions that he had about each sport. (b) The second questionnaire was the same as the first except that the subjects answered the questions in terms of their actual rather than their expected likings for and perceptions of the activities. (c) The third questionnaire was the same as the second.

Procedure. One week before the course the nineteen group members were given the first questionnaire. They were told that we were interested in the things they were going to do at the activities centre and in how they felt about them. They were told that no-one but the investigators would see their own particular questionnaire responses. On the penultimate day of the course the second questionnaire was administered to the same nineteen subjects. The third questionnaire was given to the same group of subjects six months later, although since some subjects had meanwhile left the school to start jobs, it was only possible to follow up thirteen of the original boys.

At this point we must make two points. The questionnaires were long and there were mutterings of 'Oh not again!' on the second administration – and more of them on the third. We shall have to ask whether boredom with the assessment was relevant to the results. More significant was an unanticipated intervention immediately prior to the second administration. The boys had arranged a badminton competition among themselves which was to take place later in the evening. This was cancelled in favour of a 'Safety First' film. The announcement was not greeted with universal enthusiasm!

Predictions. The heading of this section is misleading. This investigation is not a controlled experimental test of Berlyne's hypotheses. The investigation is rather an attempt to look for evidence of the same sort of relationships between curiosity and other factors as have been suggested and found by Berlyne. What follows are the expectations that guided the search through the questionnaire data rather than a set of predictions that were to be tested:

(i) If the number of questions is taken as an index of curiosity, then this should be related to rankings of skills needed and rule complexity (collative variables) of the sports.

(ii) If curiosity is a drive state then the object that may satisfy that drive should provide satisfaction. Thus it expected that sports giving rise to a greater number of questions will be liked more, *i.e.* ranked higher in terms of enjoyment and rated as more fun on the fun-loving dimension.

(iii) With the estimates available of rated ability and past experience, the data can be examined to see whether these are associated with questions and other judgements.

(iv) The possible boredom with the third administration and the 'Safety First' episode may have rendered possible investigations of covarying changes quixotic. We might otherwise have supposed those sporting activities which had proved to be relatively more enjoyable than expected to be evoking more questions on the second occasion than those sports that had been relatively disappointing. Similar tests could have been made of other associations.

Although we might well hazard some guesses as to the likely effects of the announcement of the change of programme, propriety is better preserved by simply looking at changes in questioning and other behaviour across occasions and interpreting them ex post facto.

Treatment of Results. Since the questionnaires used had no prior evidence attesting to their reliability and validity, a precautionary check was made upon the former. If boys agree in their rank orderings of the various sports, such consistency allows us to assume a measure of reliability; if they do not, this could result either from unreliability or from individual differences. Various non-parametric tests (Siegel, 1956) were used to examine the associations to be investigated.

Results

Inter-Subject Agreement. On the first questionnaire subjects agreed in their rank orderings of sporting activities for expected enjoyment ($W = 0.60$, $p < .01$), expected skill ($W = 0.49$, $p < .01$), expected fun ($W = 0.47$, $p < .01$), and likely future participation ($W = 0.41$, $p < .01$), but not on judged complexity of rules ($W = 0.08$, p insig.) or the number of questions asked ($W = 0.07$, p insig.). After experience, they continued to agree on these rankings and also on rule complexity ($W = 0.31$, $p < .01$) on the second questionnaire. For the third questionnaire there was similar agreement.

Relationships among Judgements. Calculations were made for the first administration only. For this rank ordering of expected enjoyment correlated with expected skill ($tau = 0.71$, $p = .03$), fun ($tau = 0.81$, $p = .01$) and expected future participation ($tau = 0.71$, $p = .03$), but no other relationships were significant (see Table 4.1).

Table 4.3.1. Gross Rankings of Activities for First Questionnaire

	Aspect Ranked				
Sporting Activity	Enjoyment	Skill	Fun	Participation	Complexity of Rules
Go-karting	1	4	1	1	6
Rifle-shooting	2	1	3	2	2
Archery	3	2	4	4	1
Rock-climbing	4	3	2	5	3
Orienteering	5	5	5	6	7
Badminton	6	7	6	3	5
Roller-hockey	7	6	7	7	4

Sports for which boys claimed 'high' rather than 'low' previous experience were seen as more likely to be pursued in the future ($T = 27.5$, $p < .01$), but these were not associated with differential judgements of expected enjoyment, *etc.*

Sports at which boys claimed they were proficient rather than inept were expected to be enjoyed more ($T = 2$, $p < .01$), and engaged in more in the future ($T = 6$, $p < .01$). The fun ratings were also higher ($p < .05$). Hence neither previous experience nor presumed ability related to assessments of skill required or complexity of rules, but did to expected enjoyment and future participation.

Questioning and Judgements. Boys asking two or more questions per sport on the first administration were treated as 'high', one or zero questions were labelled 'low'. For each boy, each sport could be either 'high' or 'low' in question-evoking power. For every boy the mean ranking of his 'high' questions sports could be compared with the mean ranking of his 'low' ones on the judgements. The Wilcoxon Matched-Pairs Signed-Ranks Test was used for these comparisons. Neither previous experience nor self-ratings of ability predicted questioning. Frequency of future participation, rule complexity and the fun – boring scale did not relate to questioning. Both expected enjoyment ($T = 25$, $N = 16$, $p < .02$) and perceived high demands on skill ($T = 9.5$, $N = 16$, $p < .01$) were associated with high questioning. When the analysis was made more delicate by pursuing relationships among variables for individual sports, the search was in vain. It was pointless to pursue possibilities at this level of delicacy.

Changes in Questioning and Judgements with Experience. There were drastic changes in the rates of questioning across occasions. Although there were no significant differences between the first and third administrations, both these were much higher than the rate at the second occasion ($\overline{X}t_1 = 8.15$, $\overline{X}t_2 = 1.15$, $\overline{X}t_3 = 6.00$; $\overline{X}(t_1 - t_2) = 7.00$, $T = 0$, $p < .001$; $\overline{X}(t_3 - t_2) = 4.85$, $T = 0$, $p < .001$ $\overline{X}\ (t_3 - t_1) = 1.85$, $T = 29$, $N = 12$ p insig.). With an average of only 1.15 questions per boy on the second administration, there is clearly something substantial to explain. Unfortunately the consequence of this very low rate was that we could not sensibly calculate relationships between changes in judgements and changes in questioning. These differentials and associated changes were to have been the focus of the enquiry, but the threat of 'Safety First' seems to have effectively precluded such an analysis.

The relationships between scores on the first and last occasions are also complicated by the reluctance of subjects completing the final questionnaire and the loss of numbers.

Discussion

One of the features of research in the field is that hazards encountered require the abandonment of rather large sections of data. Extraneous and unexpected events overtake expectation and the problem changes to a question of assessing whether to accept defeat or to turn events opportunistically to one's own advantage.

The large drop in questioning at the second administration is most readily attributed to the announcement of the cancellation of the badminton and the substitution of the film. We can offer further interpretations, but will not be able to discriminate between them. Perhaps the boys were simply distracted from the questionnaire, perhaps they were distracted because they were frustrated. We may note, however, that the interference did not prevent their completion of the *structured* ranking tasks. Not only did the boys show the same measure of agreement as before on enjoyableness, fun and expected future anticipation, they moved from earlier disagreement about complexity of rules to consensus. This latter change could be most easily explained by claiming that earlier disagreement was a function of differential knowledge that had been overcome by experience. It would appear that it is easier to concentrate upon convergent structured problems than it is upon divergent creative ones when distracting influences are present. The practical implication is that tasks requiring a pupil to think creatively with only minimal external stimulus control will be particularly susceptible to distractions and/or frustrations; it is futile to ask pupils to exercise their imaginations, if their minds have been already focused upon other issues. For curiosity to be expressed, distractions need to be avoided.

This serendipitous outcome is bought at the cost of our being unable to evaluate the effect of experience upon questioning. However, our real-life setting did reveal initial relationships between expected skill and numbers of questions, an encouraging finding in view of the large jump from the artificiality and tight control of Berlyne's investigations to the natural messiness of our situation. Similarly, the associations between expected enjoyment and questions encourage us to believe it is possible to move from the laboratory to the classroom without a total loss of predictability. As we shall see again in chapter 8, asking pupils about what they expect to enjoy does provide information that could be used to predict higher questioning, which in turn should stimulate the pursuit of knowledge in the area.

On the other hand, the failure of the analyses at the level of individual sports with few subjects warn against attempting to use such 'information' when it is too unreliable.

4.4. Discussion Groups of Teenage Boys

To find out the number of teeth in a horse's head, you can look into its mouth. Unacquainted as we were with teenagers, their attitudes and problems, we thought it as well to meet some on neutral territory. Four groups of fourteen year old WC boys, comprising twenty eight souls in all, were recruited to talk about school. We met at the house of a market researcher. They were slightly surprised that anyone should pay them to talk, but this they duly did, and at length, through a coffee-punctuated smoky haze. They remained anonymous. We said we wanted to find out how interesting school was, what was boring and why, and we used our interventions to keep the conversation roughly on this theme.

Some enjoyed a variety of school subjects, but those boys who were closest to the sociological criteria marking 'The Young School Leaver' of Morton-Williams and Finch (1968) spoke like caricatures of the descriptions offered by these writers. Their comments are worth reporting, because they went beyond what was tapped in 'The Young School Leaver' frame of reference. They stressed the importance of subjects being vocationally relevant, practically and concretely presented; there were sparks of enthusiasm for teachers who had derived mathematical problems from real-life settings. They did not appreciate similarities between abstract and concrete problems; they wanted to see a carpenter actually measuring wood and not just imagine one!

The more general picture was gloomy. Adult society was a sham. Teachers and politicians were noted as special examples of duplicity. People in power claimed to have the welfare of others at heart, but this was simply hypocritical. They thought that teachers commonly despised their pupils and were interested neither in teaching their subjects to others nor in the subject per se. 'It's not surprising we're bored if they are, is it?' Their cynicism was supported with examples of phoneyness and insincerity. Whether or not their perceptions were veridical is in part irrelevant. Given that they themselves were not maliciously intentioned — and they seemed quite otherwise — their teachers were not successful salesmen of themselves, their subjects or society. In our systematic investigations, we did not pursue the issue of whether children find subjects boring because teachers themselves are bored. We would probably have found this administratively impossible, school teachers being almost as sensitive as their university cousins about any evaluation of the way they conduct themselves – and with more justification. The teacher's genuine interest in his subject was mentioned as an inspiration to them to be interested, and although such involvement is unlikely to be a sufficient condition of arousing and maintaining the pupil's interest, it may generally be a necessary condition.

Other aspects of schools cited as contributory causes of boredom were muddles about timetables, odd switches in subjects being studied as a result of promotion and demotions (French in Year I, German in Year II, French in Year III and German in Year IV), 'options' which emerge as compulsory, the dullness of textbooks and their pointless exercises – a number of items that might be summed up as inconsiderate inefficiency. 'Streaming', 'type of school', these were not mentioned.

About teachers, the pupils referred to their dislike of laissez faire styles, their dislike of weak authoritianism. Respect was frequently mentioned as important, and this was facilitated by commitment to subject, commitment to teaching it, willingness to discuss subjects, ability to enforce authority. The boys were also concerned that their teachers should like them and take an interest in them as persons as well as learners. An absence of these attributes was liable to lead to them being bored.

We did not ask the boys what they were prepared to do to render their teachers' activities more productive and satisfying, but it is perhaps worthy of note that nobody volunteered comments about the pupils' responsibilities.

That the boys were genuinely uninterested in school activities and not just subscribing to a norm that required such subscription from them is implied by their confessed boredom with extra-curricular activities. Pop music and hanging about coffee bars did not appear to have positive attractive power; they were simply not as bad as other things. Again this is consistent with the portrait drawn by Morton-Williams and Finch (1968) and Bone (1972). Teenagers bored in school are generally bored, trapped in a closed circuit, impotent to break out and engage in activities, participation in which may be a necessary condition of escape.

What our discussions did not reveal was how to set about investigating either boredom or the questions that pupils have. Our efforts to tap the boys for suggestions met only with good-willed shoulder-shrugging.

4.5 Youth Club Visits (M.G. Duffy)

One of the interests of the Project was to investigate the decline in academic motivation alleged to occur among secondary school pupils, and especially among working class children. It was decided that youth clubs might provide a suitable opportunity to make informal observations of such children: these clubs attract only a third of their potential membership, and this third is composed predominantly of working class early school leavers.

The two clubs visited were both on council housing estates but in most respects, they were very different from each other. Linton Youth Club had the use of a school hall two evenings a week, and had only fairly meagre facilities – small coffee bar with an old television, table-tennis, badminton; the school playground was sometimes available for games. The prevalent atmosphere of the place was dreary. Leak Youth Club on the other hand, was held in a prupose-build clubhouse adjoining a school and had correspondingly superior facilities, including a discotheque, a games room and a colour television; members also had access to the school's hall, playing fields and swimming pool. The clubs were visited regularly and weekly in term time for over a year.

The estate on which Leak Club was situated was more modern and prosperous than that of Lindon Club, and this difference was reflected in the memberships of the two clubs. At Leak, many of those boys who had already left school were apprentices, while their counterparts at Linton were either doing unskilled jobs or were unemployed. Thus they appeared to differ in the extent to which they had benefited from the educational system. The Leak members also appeared to be more articulate and approachable; they were quite happy to talk in small groups about their experience of and attitudes towards school. They generally professed some degree of interest at least in part of the curriculum, usually expressing the wish that it was more relevant to their present or prospective work needs. None of the members spoken to, however, seemed to have had academic ambitions at any point in their school careers. Among those who were working, some regretted not having paid more attention to subjects which would have been useful to them in their jobs.

In contrast, the Linton members seemed unable or unwilling to talk in this way when approached directly. As far as I could gather, their attitude to school was one of complete apathy. A particular problem here was the obvious resentment felt by a number of the boys towards the nearby University, and in particular towards students. At the time of my arrival, funds to the club had been cut off by the local authority as part of an economy drive, and this had the effect of accentuating the disparity between the relatively privileged status of one group and the deprived status of the other. This attitude of resentment reflected itself in hostility and occasional agression towards me for some time. Aggressive behaviour was quite common, and indeed a measure of petty violence and vandalism was regarded as the norm by the club leader. Nevertheless, the police were fairly frequent visitors to the club. It seemed to me that aggression was partly a response to boredom stemming from the lack of alternative activities available, and it is interesting to speculate more generally as to what extent the behavioural differences between the two clubs were a result of the different environments provided.

Lacking as I did any specific terms of reference, the visits may have produced something more fruitful had I initially been assigned some definite role in the clubs other than that of an outside observer. This would possibly have produced more ready acceptance at Linton, though probably little more information, while at Leak, members may have been more forthcoming to somebody who was part of the club's scenery than they had been in 'one-off' discussions.

4.6 Questions in the School (W.P. Robinson & L. Abramsky)

Introduction. Over a period of several years the Head of the Science Department* in a large rural secondary modern school had built up an institution of 'question sessions'.

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* We are profoundly grateful to Mr. George Gillard for contacting us and making available all the materials for this analysis.

These had developed from the problems of handling Health Education. Hampshire produced a report (Marsh, 1964) in which the outline of a scheme was proposed. This covered personal hygiene, healthy living, family and community life and accident prevention. Set within this are the problems of telling pupils about puberty and sexual relations. These are issues about which pubescent children may suffer both from strange beliefs and an inability or unwillingness to ask what they want to know. To find out what sorts of beliefs and worries pupils had, 'question sessions' were introduced. Pupils wrote out questions on scraps of paper. These were collected, read out, and answered by the teacher. There are some weird folk-myths about ways of acquiring diseases, deformities, and babies, and this rural setting might have been a fertile breeding ground for such beliefs. Through this means sex education could be linked to the actual state of ignorance and misconception of the children rather than to adult presumption. Like Alice, question sessions' growed and spread through the Science department and across topics; they occurred as filling-in lessons, checks on material taught and responses to pupil demand.

Although the questions had been preserved, they were anonymous and their immediate context of collection was unknown. Normal techniques of analysis could not be applied, but we decided it was likely to be worthwhile to look at age and stream differences for recently collected general science questions and some of the questions about sex from earlier years. We transcribed, classified and collated the questions, basing the classifications mainly on the referential categories of Robinson and Rackstraw(1972).

4.6.1 Questions about General Science

The first distinction made in classifying questions was between 'particular' and 'general', 'particular' referring to single concrete often immediately observable phenomena or problems, *e.g.* 'What is the thing with the tube going round it for?' 'When are we going to do Biology?'. The answers to these questions are not part of 'general knowledge'. As Table 4.6.1. shows the incidence of these questions relates closely to age and stream. Streams across years are not comparable, but these would appear to be a rapid falling-off of particular questions after the first year, while within that year there is a considerable systematic increase as one moves down the stream. In the section on seven year old children's questions Arnold and Robinson (4.1) found a very high incidence of particular questions, which would support an argument that claimed a developmental trend.

Table 4.6.1. Percentages of Particular as opposed to General Questions as a function of Stream and Year.

	Stream							
	1	2	3	4	5	6	7	Overall
Year I	11(28)	16(25)	31(58)	54(96)	38(19)	94(51)	94(17)	48
Year II	15(43)	12(74)	13(16)	28(29)	10(51)			17
Year III	3(32)	11(9)	0(14)	5(18)	9(24)			6
Year IV	0(11)	8(13)	9(7)	0(11)				4

A second distinction separated the personal-procedural from other questions. These were normally 'particular' as well — they were questions asking about the personal

Table 4.6.2. Percentages of Types of Question in relation to Stream and Year

	Type of Open Question *1								*2	
Class & Stream	Ident-ifying	Defn Desc	Placing	Why	How (process)	How (degree)	Others	Closed Questions *3	Personal & Procedural	N
I 1	10	5	5	25	50	5	0	29(29)	7	28
I 2	13	25	13	4	13	33	0	4(4)	4	25
I 3	23	32	6	21	11	6	0	19(5)	26	58
I 4	25	16	15	4	16	24	0	43(10)	41	96
I 5	39	0	0	28	11	6	11	5(0)	21	19
I 6	9	0	7	54	2	16	9	10(0)	55	51
I 7	18	0	18	59	6	0	0	0(0)	88	17
IV 1&2	16	16	5	21	42	0	0	21(21)	0	24
IV Leavers	13	31	0	44	13	0	0	11(11)	0	18

* 1 Percentages are of Open questions only
2 For definitions see text
3 Percentages in brackets refer to Closed questions that are not Personal & Procedural

history and preferences of the teacher and those concerned with the nature and organisation of the school and its curriculum. These were totally absent in the fourth year pupils, rare in the higher streams of the first year and common in the lower ones (see Table 4.6.2.).

A third division was into 'closed' questions minimally answered by 'yes' or 'no' and 'open' questions that required more. Superficially 'closed' questions like 'Could you tell us what CO_2 stands for?' were treated as substantively 'open'. At first sight the proportion of 'closed' questions is fairly independent of stream and age, but when we eliminate the personal-procedural, such as 'Do you like us to use Kemekals', the proportion regularise themselves showing a higher proportion of 'closed' questions in the top stream and in older children.

Among 'open' questions 'how' questions characterised the top stream, while 'why' questions were commonest in the bottom two streams of the first year, while the fourth year obliging reflected the same pattern. There was more variability in streams 2-5, although two observations might be made. Questions seeking definitions and descriptions, 'what is the sun made of?', 'Wot makes glass?', are mainly confined to streams 2-4 in the first year, but have some prominence in the lower streams of the fourth year. Questions calling for identification, 'Who invented aoovIga?', 'Which is the hardest metal?', steadily increase in incidence as one moves down the streams of the first year, with the exception of the bottom two streams who are mainly whying.

We did not look at complexity of linguistic structure or level of conceptualisation in any systematic fashion, but impressionistically the questions of the top stream of the first year were both more complex linguistically and predicated on greater knowledge than those of lower streams. Examples may be given to illustrate this:

Top Stream:	When you cough why does a bubble burst in your lung? Why does an empty tank which has had petrol in it and has not been drained out properly, when the tanker Pacific Glory crashed, they were frightened to move it because it would blow up? If people breathe out CO_2 how does it change back into Ochgan? If any one could land on Mars could earth keep in contact with them or is there no radio that could pick up that far?
Bottom Stream:	Why do we have Scines? We do not have methl work why Sir wort is in the fish boll on the Bench next the Bar with plasti Bag on it?

We might argue for a Teutonic influence in both sets of questions but whereas that in the second extends only to capitalisation of nouns and phonetic spelling, in the first set there is a wealth of subordination, frequently of a conditional nature — an assumption, sometimes hypothetical, is made explicit and, in the middle two, the questions are based on the juxtaposition of conflicts of some kind.

If we were to be euphoric enough to suggest a developmental trend which is a joint function of age and attainment, we would suggest the following successive concentrations of interest: explanation in terms of 'why', identification of elements, identification of categories and a concern with the composition of these, and finally a concern with processes and methods introduced by 'how'. There is a parallel increase in complexity of structure and thinking with questions increasing involving hypotheses (closed questions) or the posing of conflicts rather than simple assimilation of more facts.

4.6.2. Questions about Sex.

Questions from second and third year pupils collected over a number of years were counted and collated. The 281 children concerned had asked a total of 982 questions, of which thirty six per cent were directly or peripherally related to sexual matters. Boys and girls in the second and third year were invited by the general science teacher to submit written questions about anything they wanted to know. They were assured of receiving answers to these questions.

The 281 children asked a total of 982 questions. Of these questions, 36% were concerned with sexual matters in the broad sense of this term. Included in this category were questions about the anatomy and physiology of the reproductive system, normal and abnormal sexual relations, reproduction of both people and animals, and some types of neo-natal care such as breast-feeding. Also included were questions about maturation, contraception, venereal disease, secondary sex characteristics, and some social situations and attitudes. Only these questions were analysed.

Each question was coded according to which of fifteen categories it came under (see Table 4.6.3. for list of categories and percentage of questions in each). One third of the questions were about pregnancy, childbirth, some aspects of neo-natal care and possible congenital defects of the baby. Although these questions represented a higher proportion of the girls' questions than of the boys', they did also represent more than one quarter of the boys' questions. For the most part they were straightforward requests for simple information. They were not emotionally charged nor were they questions which one would expect parents or teachers to find embarassing to answer. Some examples are: 'When the womb swells what happens to the digestive systems?' asked by a second year boy; 'What would happen if the woman didn't have liquid in her womb?' asked by a third year boy; and 'What is a miscarriage?' asked by a second year girl; and 'How long does a baby feed off its mother's breast?' asked by a third year girl. The pupils seemed to find this a very interesting subject if one accepts number and type of questions as an indication of interest. If this is true, then children could learn a great deal about all the life sciences through a detailed study of the development of the embryo, the effects of pregnancy on the body, and the way in which a child is born and becomes adapted to a biologically independent existence. This would put into, what is for the pupil an interesting context, the study of microbiology, the various systems of the boyd, types of tissue, and could easily be used as a point of departure for comparing various types of animals.

One quarter of the questions were about sexual anatomy, physiology, and maturation and about normal male-female sexual relations. This was not surprising as these were more often questions which children might normally find embarrassing to ask parents or teachers. Some examples are: 'Does a man feel his sperm go down his penis when he is having intercourse?' asked by a third year girl; and 'How long does a man keep his penis in at the longest?' asked by a third year boy. One would expect boys and girls of this age to be keenly interested in these subjects and to find difficulty in getting this sort of information either because of their own inhibitions, the inhibitions of others or a combination of both.

One interesting difference between the boys' and girls' questions was in the category of male-female social relationhisps. Seventeen per cent of the girls' questions fall into this category whereas only three per cent of the boys' questions could be coded in this way. One explanation for this would be that girls of this age are more sexually developed and mature and are more interested in having a relationship with a member of the opposite sex than are boys of the same age. A very small number of questions (3%) were about abnormal male-female or person-animal relations. A similar number of questions were about homosexuality. The questions about abnormal sexual relations were mainly about sexual assult. Some examples are: 'How can you kill a woman by intercourse?' asked by a second year boy; and 'If you are assulted before you become a woman, will it do you any harm?' asked by a second year girl. There were two questions about beastiality.

Three per cent of the questions were based on misinformation, and this was felt to be encouraging. Examples are: 'Why is there hair on a man's penis?' asked by a second year girl; and 'A man had a baby at the age of 17, how was this come by? This was in the Daily Express'. asked by a second year boy. Overall, these children seemed to be reasonably well-informed on the subject, but keen to learn more about it. This interest was mainly directed towards information about normal, healthy sexual activities. They did not ask many questions about contraception, but what they did ask indicated a fair amount of ignorance on the subject. An example is 'Can two people have sexual intercourse without having a baby? If so, how?' asked by a third year boy. A few of them did mention the sheath in their questions, but mainly to ask what it was. An example is 'What is a rubber johnny and what is it used for?' asked by a third year girl.

Table 4.6.3. Characteristics of Questions about Sexual Matters (expressed percentage all sex questions)

		Group	
			% of Total Number of Questions
	Boys	Girls	Pupils
1. Sexual Anatomy and maturation and details of menstruation	11	13	12
2. Attitudes towards sex	1	5	3
3. Male-female normal sexual relations (including contraception)	17	13	15
4. Abnormal sexual relations (including rape, bestiality)	4	2	3
5. Pregnancy	16	16	16
6. Childbirth and neonatal care	10	16	14
7. Defects in baby	2	5	4
8. Masturbation	2	1	2
9. Homosexuality	6	2	4
10. Hermaphroditism	4	1	2
11. Secondary sex characteristics	4	1	2
12. Male-female social relationship	3	17	11
13. Venereal Disease	6	2	4
14. Animal sex and reproduction	8	3	5
15. Definitions (not fitting above categories	6	2	4

4.7. References

Adorno, T.W., Frenkel-Brunswik, Else, Levinson, D.J. & Sanford, R.N. The authoritarian personality. New York: Harper, 1950.

Ausubel, D.P. *Educational psychology:* a cognitive view. New York: Holt, Rinehart & Winston, 1968.

Bellak, A.O., Kliebard, H.M., Hyman, R.T. & Smith, F.L. *The language of the classroom.* New York: Teachers College Press, 1966.

Berlyne, D.E. *Conflict, arousal and curiosity.* New York: McGraw-Hill, 1960.

Bone, Margaret. *The youth service and similar provision for young people.* London: Her Majesty's Stationery Office, 1972.

Brown, R. *Social psychology.* Glencoe, Ill. : Free Press, 1965.

Heber, M. A comparative study of the questions asked by seven year old boys differing in social class. Working Paper, Southampton, 1972.

Hodgins, C.G. Sociometric status as related to deviation and non-deviation from peer group behaviour patterns. University of Southampton: M. Phil., 1969.

Marsh, R.M. *A new approach to health education in the schools.* Winchester; Hampshire County Council, Education Committee, 1964.

Morton-Williams, R. & Finch, S. *Young school leavers.* London: Her Majesty's Stationery Office, 1968.

Robinson, W.P. & Arnold, J. The question-answer exchange between mothers and young children, Final Report; Social Science Research Council, 1973.

Robinson, W.P. & Rackstraw, S.J. *A question of answers.* London: Routledge & Kegan Paul, 1972.

Rotter, J.B. Gneeralised expectancies for internal versus external control of reinforcement. *Psychol. Monogr.,* 1966, *80,* 1-28.

Addendum

Barnes, D. *Language learner and the school.* Harmansworth: Penguin, 1969.

Hess, R.D. Social Class and Ethnic Influences on Socialisation, The. In P.H. Mussen (ed.) *Carmichael's manual of child psychology.* Vol. I. New York, Wiley 1970.

Hess, R.D. & Shipman, V.C. Cognitive elements in maternal behaviour. In J.P. Hill (Ed.) *Minnesota symposia on child psychology. Vol. 1.,* Minneapolis : Univ. of Minnesota Press, 1967.

Siegel, S. *Non-parametric statistics.* New York : McGraw-Hill, 1956.

CHAPTER 5 · WHO IS BORED? (W.P. ROBINSON)

5.1 WHAT BORES YOU?
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5.1.2 Method
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5.2 BOREDOM IN THE YOUNG SCHOOL LEAVERS
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CHAPTER 5

WHO IS BORED?

Introduction. The analysis of boredom, curiosity and questioning made in chapter 2 proposed certain links among them. Between curiosity and questioning the link was not so strong that either could be seen as necessary or sufficient conditions of the other. Curiosity can be manifested in activities other than questioning. Asking questions may serve functions other than that of attempting to satisfy curiosity. However, we are able to specify some of the conditions under which we can stimulate curiosity and questions (see chapters 2 and 3).

Boredom was treated as an internal state whose presence ensures the absence of curiosity; it would be odd to allow them to co-exist. In Figure 2.3 the two states were associated with different stimulating conditions: while curiosity is one type of uncertainty stemming from ambiguities, novelty, complexity, incongruity and surprisingness of stimuli, boredom is alleged to arise when external stimulation is minimal or monotonous, *i.e.* repetitive, predictable and regular. There are several possible responses to such a state: convert the monotony into nothing by falling asleep, indulge in diversive exploration either behaviourally by moving around or playing, or mentally by acts of imagination and thinking. However, neither of these coping strategies may be available or allowable. The most relevant type of example in this context is of a teacher droning on with an eagle eye open for wandering attention among the pupils. The norms and rules dictate that the pupil stay where he is, that he attend and learn. The choice is between attending and breaking the norms and risking what sanctions may arise. We would not expect task-related questioning to occur in this situation.

We also noted in chapter 2 (sec. 2.5) that chronic failure to resolve conceptual conflicts may lead to chronic states of anxiety, especially if failures are associated with punishments of some kind. It was suggested that there may be more than one way of handling this anxiety, but that in any case its victim is likely to remain unresponsive to externally provided stimulation associated with learning. This state may also be labelled 'boredom'. Here again, however, we would not expect sufferers to have knowledge-seeking questions.

Hence, regardless of how wide or narrow the scope of the word 'boredom', its presence should not be associated with question-asking. Or if it is, the questions are likely to serve as diversions, protests or complaints rather than as requests for information. Paradoxically, if one is interested in states associated with question-asking, it is better to look at boredom rather than curiosity, for whereas the association between curiosity and questioning is probabilistic and contingent, information-seeking questions are a sufficient condition for the absence of boredom. To find out who is bored under what circumstances can be used to diagnose who is not asking questions under those circumstances.

But are pupils bored? And if they are who is most bored by what? What are the antecedents and consequences of being bored? Inevitably the first problem is one of measurement. Commonsense, that mythical morass of legendary wisdom, would encourage simplicity and naivety and assume that this was an instance where one could ask people and that their reports could be reliable and valid. Unwilling to be more complicated and devious than necessary, we began by asking pupils what bored them and what they did about it. This pilot study gave evidence to encourage to rely further on people's reports.

At this same time we came across the Schools Council Enquiry on 'Young School

Leavers' by Morton-Williams and Finch (1968). We regretted that we were unable to mount such an impressive survey and noted with even more regret that they had obtained information about boredom which they had analysed only against age of leaving school – appropriate for their frame of reference, but sad for ours. It was not until 1972 that we realised it might be possible to make a secondary analysis of these data and thereby conduct a large survey of boredom. As mentioned in the acknowledgements, once necessary permissions were obtained, Miss Morton-Williams and Mr. Finch very kindly made all necessary data available for such an analysis. This makes up the bulk of the chapter.

5.1 What bores you?

5.1 Introduction

In conjunction with several other investigations designed to test the competence of WC and MC children to formulate questions in linguistically appropriate ways, it was decided to include also a pilot study into boredom. The intention was not to consider the problem in depth, but to establish guide-lines along which further investigations could be directed.

We adopted the commonsense technique of asking children to write down lists of things which bored them, their reasons for these being boring, and some of the things they did when they felt bored. It was expected that WC children would admit to being bored by more passive intellectual activities than their MC counterparts, whilst at the same time, they might choose more active pastimes as a release from boredom. It was also expected that perhaps WC children might give more examples of unconstructive means of relieving their boredom, such as 'biting my nails' or 'fiddling with things', and possibly show a greater tendency toward behaviour that could become anti-social, for example, 'shooting peas' or 'banging desk lids up and down'.

5.1.2. Method

Materials, Instructions and Procedure. The design was simple and direct. The children were each given a single sheet of paper, divided into three sections. They had already completed several other tasks (see chapter 7) and on this last paper, they were asked to write down, in the appropriate spaces, things they found boring, their reasons, and the kinds of things they did when they felt bored. The three instructions were read aloud by the experimenter whilst the children looked at them. It was explained that answers should be written in the spaces provided under each section heading. They were allowed five minutes to complete the task. The specific section headings were:

1. Please write down a list of the things which you find boring.
2. Please write down why you find some of these things boring.
3. Please write down some of the things which you do when you feel bored.

The task was completed by the class as a group, in their own class room, during what would have been lesson time. The teachers were absent throughout, and the experimenters, both of whom were female, attempted to induce a friendly, relaxed atmosphere into the proceedings, whilst at the same time, being firm regarding the noise and chattering occasioned by the overcrowded conditions and occasional interruptions.

Subjects. Two local mixed primary schools had been selected for this series of studies, one situated in a MC district, the other in a WC area. The majority of parents of children in the MC sample were members of staff at a university, and the children lived in owner-occupied residential districts, whilst the parents of the WC children were mainly manual workers, many connected in some way with the docks. The two groups of children were both of ten year olds, tasks being performed by the top stream of the final year in each school. Information was obtained from the schools about the occupations of both parents of every child, and classification was made according to the Hall-Jones Scale. Three immigrant children from the WC sample were withdrawn, and so also were two children initially classified in the lower status range, but whose mothers held higher status occupations.

The final sample consisted of twenty seven children from each of the two schools (fifteen boys and twelve girls in each). In the MC sample, children ranged from social classes 1 – 4 (Means – Boys: 1.8; Girls: 2.0), and in the WC sample, from social classes 5B – 7, (Means – Boys: 5.6; Girls: 5.4).

5.1.3 Treatment of Results and Results

The completed scripts of the final sample were divided into four sets – boys and girls for each of the two social class groups.

1. The first step was to categorise each child's responses on the first and third questions (that is the things they found boring and the things they did when they felt bored) into two sections which we named Active Responses and Passive Responses. These two main headings were each further subdivided within the first and third categories, into four groups.

    (i) Academic or associated activities.
        e.g. 'Arithmetic' (Active)
        'Mrs. X giving lectures in Scripture' (Passive)
    (ii) The home and things done specifically in the home environment.
        e.g. 'Washing up' (Active)
        'My parents talking to each other' (Passive)
    (iii) Social activities.
        e.g. 'Visiting my friend' (Active)
        'Sleeping' (Passive)
    (iv) Entertainment and Sport.
        e.g. 'Play Football' (Active)
        'Watch T.V.' (Passive)

    In the first stage, we considered the respective scores obtained by the four groups of children under the two main headings of Active and Passive Responses, but could find no significant difference between them. All children appeared to make approximately the same number of responses in each category.

2. The second stage was to look at instances of anti-social behaviour given by children as a release from boredom, *e.g.* 'Flicking ink', 'Banging desks'. The scores of the four groups of children were approximately equal.

3. It was observed that several children had made 'unconstructive' responses in answer to Q.3, – what did they do when they were bored, *e.g.* 'Sleep', 'Nothing'. There were no significant differences by social class or sex.

4. 'Watching television' and the names of specific television programmes occurred frequently in the responses of several children. Is television seen as something to occupy the time when one is bored, or is it considered to be boring in itself? There were unfortun-

ately insufficient data to enable us to answer the first question. On the second issue eight of the fifteen MC boys found television programmes boring, but only two of the WC boys (Fisher Exact Probability Test, $p < .02$). In the working class, seven of the twelve girls found television boring, giving a sex difference ($p < .02$).

5. Sporting activities appeared on the lists as antidotes to boredom. Ten WC boys preferred to relieve their boredom by participating in sports of various kinds, no MC boys ($p < .004$). Only two WC girls mentioned sports, giving a sex difference within the working class ($p < .04$).

6. The largest block of 'boring things' listed by the children were specific school subjects. A two way analysis of variance of social class and sex against the total number of subjects mentioned by each pupil showed no effects for sex or class on their own. However, there was a significant sex x Social Class interaction ($F = 10.06$, df 1/50, $p < .01$). Within this WC boys mentioned more subjects than MC boys ($\bar{X}$/MC = 1.2, X/WC = 3.2, $F = 9.85$, df 1/29, $p < .01$). While in the working class boys mentioned more boring subjects than girls ($\bar{X}$ Boys = 3.2, $\bar{X}$ Girls = 2.0, $F = 5.16$, df 1/26, $p < .05$), this was reversed in the middle class ($\bar{X}$ Girls = 2.8, $\bar{X}$ Boys = 1.2, $F = 4.90$, df 1/26, $p < .05$).

7. Children's reasons were not sufficient to merit analysis.

5.1.4 Discussion

While there were 'trends' for WC children to be more bored by passive activities, to say they would relieve boredom through motor activities, and to admit to more 'unconstructive' and 'anti-social' means of achieving relief, these were too weak to do anything other than suggest they are worth exploration.

The significant differences in Social Class responses to television show that WC boys are less bored than either the WC girls or the MC boys. It is possible that perhaps those who mention television programmes as more boring are more discriminating in their viewing than the WC boys. However, other factors are involved. The large attraction of sporting activities for WC boys could mean that they do not watch very much television; it is possible also that their parents have similar tastes to their children, and may therefore, for the most part, view mainly Westerns, Quiz games and soap operas; the same qualification applies in reverse of course, in that MC parents are perhaps more inclined to watch current affairs programmes and documentaries, which may be boring to their ten year old children. This possibility is borne out to some extent by the specific programmes mentioned as boring by the middle class such as 'Panorama' and 'World in Action'.

The high scores obtained by MC girls in stating specific school subjects as a cause of boredom can be explained to some extent by the inclusion of one particular subject by many of the girls (seventy five per cent of the sample). Over half of the MC boys also gave this subject as being boring. Unless children of this age have an innate or acquired dislike of this particular subject, it might be suggested that the personality of the teacher or the particular teaching methods employed in this instance may be a contributory factor to the attitudes of the children towards the subject.

In conclusion, two final comments should be made about the study. Firstly, that as the children had already worked hard at various other experiments, we left ourselves open, when asking what they found boring, to remarks such as 'doing experiments'. None of these, however, appeared in our final sample. A second consideration which must be mentioned, is that the experiment was carried out within the school environment, and the instructions to the children in the sample may not have been sufficiently explicit in asking for a list containing *anything* which they considered to be boring, rather than things particularly associated with school.

Within these limitations pupils' reports appear to be a sensible way of setting about the location of boredom in the social structure.

5.2 Boredom in the Young School Leavers

5.2.1 Introduction

Full details of the sampling design and specific measures used are to be found in Morton-Williams and Finch (1968). References to these measures are given in terms of the page numbers of their report and the question numbers. All deviations from their coding are made explicit.

Sample. The 4618 thirteen to sixteen year old children sample were used. The record of one boy had been nibbled away by a mouse, leaving 4617 subjects. 'The sample design was a two stage multi-stratified random one. At the first stage a sample of maintained secondary schools in England and Wales was taken, at the second samples of thirteen to sixteen year old pupils and ex-pupils, their parents, their teachers (and older leavers) were selected from these schools so that the probability of selection was equal for all members of each population (*p.* 247).' Actual and theoretical distributions were shown to match closely and directly against types of school and geographical region. Indirectly, the social class distribution of the parents in the sample also coincided with that of the population at large. Interview success rates were high: pupils (96%), teachers (99%), parents (94%).

Materials. Teacher and parent interviews lasted approximately one hour, those of pupils three quarters of an hour. The interviews ranged across attitudes to school, perception of school objectives, the value and interest of subjects studied, secondary school curriculum, relations between home and school, careers advice and problems associated with raising the school leaving age with special attention focused on fifteen year old leavers. Data about demography and academic achievements were included.

Our main interest was in boredom. For seventeen school subjects, pupils were first asked whether or not they were studying each. Of those being studied they then picked out those that they thought useful and those they thought useless, leaving a third set of neither. They then picked out the subjects they thought interesting and finally those they found boring (*p.* 260-261, Q.7). Morton-Williams and Finch found the split between boring and the other two categories more useful than that between interesting and the other two, and since this coincided with our interest we were happy to follow their advice. A *Bore Score* was calculated as the number of subjects labelled boring expressed as a percentage of all subjects studied. For the main analysis a four stage division was employed: 0-10%, 11-20%, 21-30%, 31% and above.*

The Bore Score was cross-tabulated against a variety of other measures that may be grouped in the following way. References given are to page and question numbers of the original report.

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*Programming and calculating were conducted through the efficient good offices of Dr. C.D. Creed and Mrs. A. Wardle.

1. **Miscellaneous items from Teacher** (*p.* 281)
    - (i) Sex of teacher (from Name): male, female, unknown
    - (ii) Estimate of parental interest in pupil (Q. 13): 3 value: very, average, little or no
    - (iii) Discussion with parents in last two years (Q. 12): both, mother, father neither

2. **School and class characteristics** (*p.* 281)
    - (i) Size of class (Q. 1): 5 value: 0-10, 11-20, 21-30, 31-40, 41-50
    - (ii) Streaming (Q. 2): yes, no
    - (iii) Estimated proportion of class taking
        - (a) GCE 'O' levels (Q. 4)
        - (b) CSE (Q. 4)
        - (c) other external examinations (Q.4)
    - (a), (b), and (c) were each coded with one of 4 values: none, < half, half but not all, all

3. **Attributes of Pupil as perceived by Teacher** (*p.* 281)
    - (i) Industriousness (Q. 10): 5 points: a *very* hard worker generally → a poor worker or lazy
    - (ii) Shy/withdrawn (Q. 11): 4 points: No or not more than normal → very
    - (iii) Aggressive . . . . (Q. 11): 4 points: No or not more than normal → very

4. **Acheivements and ability reported by Teacher** (*p.* 281)
    - (i) & (ii) Estimate of number of subjects pupil will take at (a) GCE and (CSE (Q. 5), both 0 → 9
    - (iii) Estimate of pupil's success rate at CSE and GCE (Q. 6): 6 value: > OA → 4 CSE
    - (iv) IQ score at Eleven Plus (Q. 7): No data: 5 values, 121+, 106-120, 95-105, 85-94, < 85

5a **Actions of Pupil reported by Teacher** (*p.* 281)
- (i) Truancy (Q. 9): 3 point: frequently, occasionally, never

5b **Actions and Attributes of Pupil reported by Pupil** (*p.* 258)
- (i) At school or left (Q. 1): Left, still at school
- (ii) Leavers only – date of leaving: Easter '65, July '65, Easter '66
- (iii) Non-leavers only – year of schooling: 3rd, 4th, 5th
- (iv) Age (Q. 2): 13, 14, 15, 16
- (v) Intended or actual age of leaving (Q. 29): 15, 16, 17, or 18 (p. 269)
- (vi) Sex: male, female

6. **General Attitudes of Pupils to School and Teacher** (*p.* 269)

    For nine questions, pupils answered Yes, No or Don't know (Q. 269)
    - (i) Most days you look forward to going to school
    - (ii) You get fed up with teachers telling you what you can and can't do
    - (iii) School is the same day after day, week after week
    - (iv) The teachers take a great deal of interest in you and help you a lot
    - (v) You are delighted when you have an excuse to stay away from school
    - (vi) There are lots of interesting things going on in school
    - (vii) Teachers forget you are growing up and always treat you like kids
    - (viii) Most of your friends come from near home rather than from the school
    - (ix) Most of what they teach you at school is very useful to you

7. **Pupils' assessments of Usefulness of School subjects** (*p.* 261)

   For each subject studied the pupil judged it to be Useful, Useless or Neither
   The Uselessness Index was the ratio of 'Useless' subjects to all subjects studied converted to a four value percentage score: 0-9, 10-19, 20-29, 30 and above

8. **Generality of Boredom** (*p.* 279)

   Q. 47. Do you usually enjoy your sparetime or do you often get bored?

9. **Parental Reports on Pupil (X)** (*p.* 301-303)

   Questions 20, 31, 32 & 33 were addressed only to parents of leavers
   (i) Is X employed (Q. 20): full time now or has been, has not worked full time
   (ii) Payment for keep (Q. 31): yes, no
   (iii) If payment on Q. 31, amount: up to 30/-, >30/- – 50/-, > 50/-
   (iv) X purchases own clothes? (Q. 32): all, some, none
   (v) Parents help X with money (Q. 33): yes, no
   (vi) Should X help in house etc. (Q. 34): yes, no
   (vii) Does X help? (Q. 34): a lot, a little, never
   (viii) Does X help as much as he should? (Q. 34): yes, no
   (ix) Where does X spend most of spare time? (Q. 35): at home, elsewhere, equal
   (x) Parental satisfaction with Q. 35 answer (Q. 36): quite happy, not entirely happy
   (xi) How much time *out of school* does X spend on schoolwork? (Q. 37): some, none or hardly any
   (xii) Parent's evaluation of answer to Q. 37: should spend more, less, about right
   (xiii) Amount of spare time X reads books (Q. 38): a lot, moderate amount, none or hardly any
   (xiv) Evaluation of reading amount (Q. 38): should be more, less, about right
   (xv) Is extra-school book reading for X seen as important (Q. 39): important, not

10. **Parental Report on Own Behaviour** (*p.* 303)

   (i) If you (or your husband) have any time to relax, do you *like* to do some reading? (Q. 40): husband – yes, no; wife – yes, no
   (ii) Number of books owned: >5, 1-5, 0

11. **Characteristics of Household** (*p.* 304, Q. IX)

   (i) Mother's age: 5 values used: up to 39, 40-49, >49
   (ii) Mother's marital status: married, widowed/divorced/single
   (iii) Mother's employment: full-time, part-time, not working
   (iv) Father's age: 3 values used: up to 39, 40-49, >49
   (v) Father's marital status: married, widowed/divorced/single
   (vi) Father's employment: full-time, part-time, not working
   (vii) Parents in household: both parents, mother only, father only, neither
   (viii) Dependent children in family (Q. XI): 7 values: 1, 2, 3, 4, 5, 6 or 7, >8)
   (ix) Position of child in family (Q. X): 5 value: 1st, 2nd, 3rd, 4th, 5th or more
   (x) Mother's daily absence (Q. XXII): home all day, out <5 hours, out 5-<10 hours, out 10+ hours

12. **Characteristics of House** (*p.* 304)

   (i) Ownership (Q. XIII): owned, rented, rent free
   (ii) Type of House (Q. XII): detached, semi-detached, terrace, flat, rooms
   (iii) Number of bedrooms (Q. XIV): 1, 2, 3, 4 or more

(iv) Bedrooms needed: *(complex sensible index)*: 2, 3, 4
(v) Shortfall in needed bedrooms. > −1, −1, 0, +1, >+1

13. Education of Siblings and Parents (*p.* 305, 306)

(i) Siblings at Comprehensive or not (Q. XV): yes, no
(ii) Siblings at Public, Grammar or Technical School (Q. XV): yes, no
(iii) Age at which Father completed School (Z. XVIII): 14, 15, 16, 17 or more
(iv) Type of Father's school (Q. XVII): not grammar or private, grammar, private
(v) Age at which Mother completed School (Q. XVIII): 14, 15, 16, 17 or more
(vi) Type of Mother's school (Q. XVII): not grammar or private, grammar, private
(vii) Educational qualifications of Father (Q. XIX): none, 'O' levels, higher certificates, diplomas & degrees
(viii) Educational qualifications of Mother (Q. XIX): none, 'O' levels, more than 'O' levels
(ix) Further education of Father (Q. XIX): none, part-time, apprenticeship, full-time tertiary
(x) Further education of Mother (Q. XIX): none, part-time, apprenticeship, full-time tertiary

14. Income and Social Class of Parents (*p.* 307)

(i) Income Father (Q. XXIII): 8 values: up to £7.50, 7.50-9.99, 10-12.49, 12.50-14.99, 15-19.99, 20-24.99, 25-29.99, 30 and more
(ii) Combined income (Z. XXIII): 8 values: up to £7.50, 7.50-9.99, 10-12.49, 12.50–14.99, 15-19.99, 20-24.99, 25-29.99, 30 and more
(iii) Social class (Q. XX): 6 value: Registrar General's coding: I-professional, II-managerial and technical, IIIa clerical and minor supervisory, IIIb skilled manual, IV-semi-skilled, V-unskilled
(iv) Father's socio-economic Grouping (Q.XX): 7 value: The 1971 Census used 17 categories for locating jobs which were banded together in this analysis into 7 bands, the original Census numbers being in brackets.

1.	(1,3,4,16)	Employers and managers in large establishments, and all professional workers
2.	(2, 5, 13)	Employers and managers in small establishments, including farmer employers and managers, and intermediate non-manual workers
3.	(6)	Junior non-manual workers
4.	(8, 12, 14)	Foremen and supervisors, manual occupations and other workers on own account, including farmers
5.	(9, 16 other than professional)	Skilled manual workers
6.	(7, 10, 15)	Semi-skilled manual, personal service and agricultural workers
7.	(11)	Unskilled manual workers
8.	(17)	Unclassifiable
9.	No information	

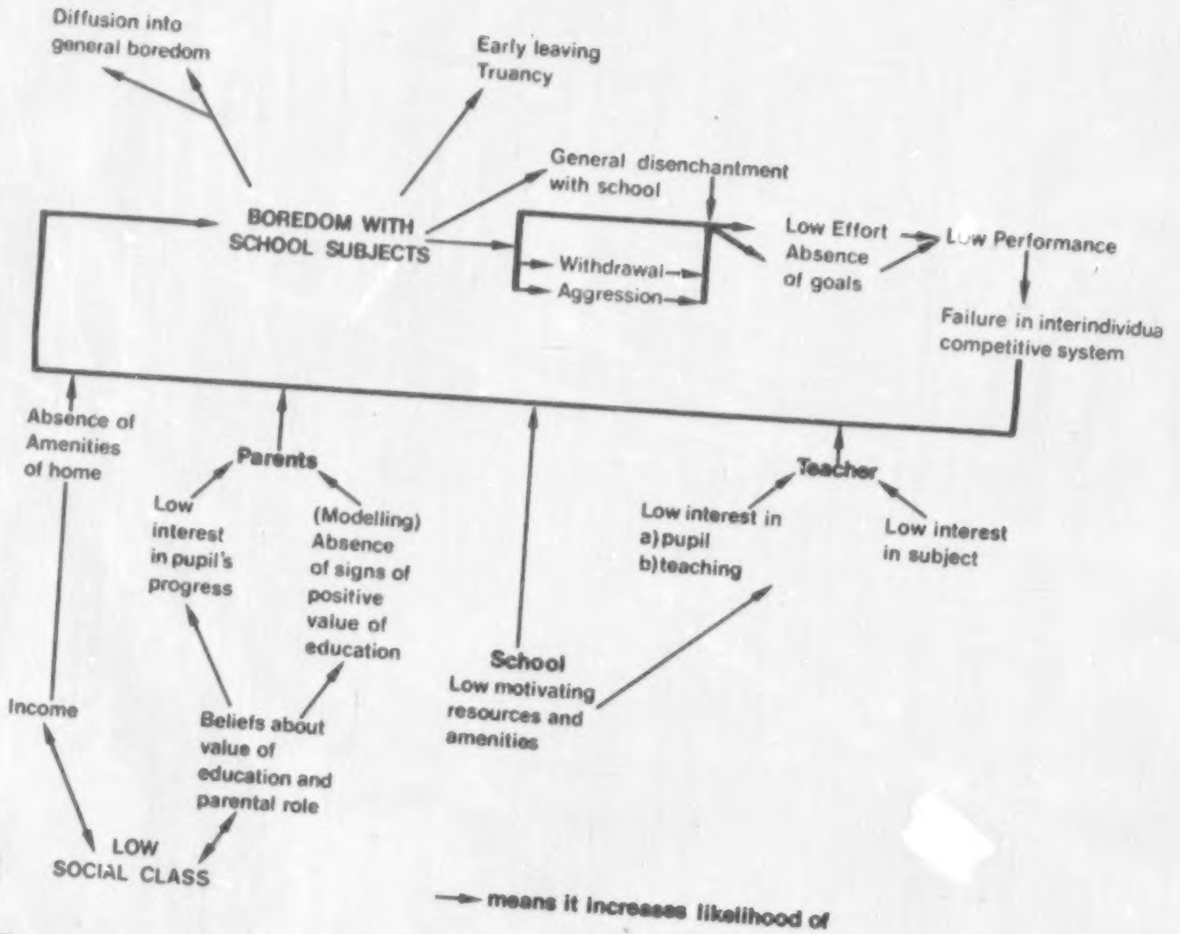
Diffusion into general boredom
Early leaving Truancy
General disenchantment with school
BOREDOM WITH SCHOOL SUBJECTS
Withdrawal
Aggression
Low Effort
Absence of goals
Low Performance
Failure in interindividua competitive system
Absence of Amenities of home
Parents
Low interest in pupil's progress
(Modelling) Absence of signs of positive value of education
Teacher
Low interest in a) pupil b) teaching
Low interest in subject
School
Low motivating resources and amenities
Income
Beliefs about value of education and parental role
LOW SOCIAL CLASS
→ means it increases likelihood of

Fig. 5.1 Representation of Dynamic of Boredom and other Variables

The selection of these items rather than others was based on a mixture of criteria. Academic interest required that we look at certain sociological aspects of boredom and at school achievements of the pupils. However, administrative convenience, speed and cost also affected decisions. In the end only three of the six possible data cards for each pupil were used such that they contained information from the three sources of pupil, parent and teacher and the estimates of boredom, achievement and social class. Other variables of interest on these cards were included.

5.2.2. Hypotheses

To ease understanding of the manner in which the theoretical ideas mentioned in chapter 2 and the introduction to chapter 5 translates into expectations about the distributions of the particular items incorporated into the analysis, Figure 5.1 was constructed.

The central feature is 'boredom with school subjects'. Immediate expressions of this might be withdrawal, aggression, (diversionary activities) and/or reduced effort in learning these subjects. Reduced effort might well involve an absence of performance-directed aspirations for improvements and both should lead to lower performance. In the absence of extra-learning attractions at school, truancy is one intermittent way of avoiding boredom, while leaving school as soon as possible finalises escape. The consequences of low performance are likely to be contingent upon the values placed upon academic success by school, parents and peers, but, other things being equal, one might expect feelings of failure to be more pronounced when the school is formally competitive. Streaming and a high incidence of pupils taking national examinations are two symptoms of competition. A history of failure and an expectation of future failure, it has been suggested, may in turn increase boredom or anxiety states reported as boredom. It should be noted that the system is closed and can sustain itself. However, external influences can also affect it.

Pupils can use teachers as models. If teachers are bored by their subjects, pupils should be less likely to be enthusiastic about them. Teachers can show no respect for or interest either in the learning of their pupils or in the pupils as people (see chapter 4, section 4). Lack of example and encouragement from teachers should tend to maintain or increase boredom. The behaviour of teachers will of course be constrained by the resources of the school and the behaviour of other teachers and heads — and so on up to the Minister of Education and Science. Peers can have similar relevance, as will parents.

Both the interest and encouragement offered by parents should affect bordeom, these in turn will be expressions of more general beliefs about the value of education for living. As with teachers, the power of parents as models should not be forgotten.

Children can lack material resources that might prevent or ameliorate the boredom — low performance cycle, *e.g.* overcrowding in the home. These amenities will be in part, but only in part, contingent upon the wealth of families. The concept of 'social class' normally embraces many covarying features of different life-styles that should affect the boredom of children with school subjects. If the story told in chapter 2 is correct, lower working class children should be particular victims of the boredom cycle.

5.2.3. Treatment of Results

To comply (happily) with government regulations about the necessity of rendering individuals in social surveys unidentifiable, some variables were strongly banded before the data were transferred. The recombination of the seventeen occupational categories into seven precluded some finer comparisons that might have been made, *e.g.* rural/urban.

Computer programmes were written to calculate the Bore Score which was subsequently used to allocate pupils to four groups. A second programme generated cross-breaks of all other variables against this. After the elimination of 'no information' 'no answers' and 'don't know' and the occasional combination of rare values of other items, X^2 analyses were run. When these were significant ($p < .05$), they were partitioned (see Maxwell, 1961). This technique enables a more precise location of divergences between expected and observed frequencies. For example, there might be an association between Bore-Score and social class. Partitioning enables a distinction to be made between the lower working class being very bored with all others equal and the upper middle class hardly bored at all with all others being roughly equal.

Full raw data and results are relegated to the Appendix. To report the results with scholarly precision would have been boring, but the appendicised provision of the raw data allows argumentation and disagreement about the heavy simplification made to render the results readable. There were differences in the numbers of pupils about whom one had information, especially on the Parent's questionnaire. Evidence was that these numbers were either so small or so distributed as to be irrelevant to the associations with the Bore Score.

Preliminary inspection of the cross-breaks and partitioned X^2 s suggested that three main types of association dominated the results. Sometimes no association was obtained. Sometimes the association was monotonic, *viz.* the incidence of Bore Score increased as the value of the associated variable increased. Thirdly, the high Bore Score category was deviant, that is the three other categories gave roughly similar distribution, but the most bored group deviated from this. Results are not described in such detail and the only contrasts generally given are between the extreme, a percentage of the highest Bore Score group is contrasted with that from the lowest. Many of the X^2 values are way beyond the one in a thousand chance occurrence and some of these are complemented with the value of C, the Contingency Coefficient.

5.2.4. Results

The original analyses of Morton-Williams and Finch showed associations between the Bore Score and early leaving that made good sense, thus helping to establish the validity, and ipso facto, the reliability of the measure. Two items in the 'Attitude to School' questions allow an initial check on validity in this analysis. Sixty six per cent of high Bore pupils claimed that school was the same day after day (6/3) compared with thirty nine per cent of the Low Bore pupils ($X^2 = 166$; df = 3, $p < .001$, $C = .19$). While only forty five per cent of High Bore pupils thought there were lots of interesting things going on in school (6/6), seventy four per cent of the other pupils felt there were ($X^2 = 195$, df = 3, $p < .001$, $C = .20$).

In chapter 3 Duffy's experimental studies showed up associations between reported interest and value. Not only did adolescents claim greater interest in what they thought was valuable, they asked more questions and learned and remembered more about such matters. Here, it can be asked whether or not there are associations between perceived usefulness and interest. Morton-Williams and Finch point out aspects of independence between the two (*p.* 60), subjects can fail to be boring because they are enjoyable per se. While recognising the validity of a dissociation in both directions, certain disciplines may well be both useful and boring as well. Duffy's investigations require us to expect positive association overall — in so far as secondary schools are concerned to educate, we must argue that perceived uselessness should lead to boredom. The data are strongly consistent with this. Bore Score related very closely to the Uselessness Index (7) (X^2 = 946, df = 9, p <.001, C = 0.41). This is true at the same significance level for all partitions, higher Uselessness Indices going with higher Bore Scores, with the strongest contrast being between the highest Bore Score/Uselessness Index and the rest. While only seven per cent of the pupils who see less than ten per cent of subjects studied as useless find more than thirty per cent of subjects boring, forty three per cent of those seeing thirty or more per cent useless report more than thirty per cent boring.

Figure 5.1 indicated several responses to boredom with school subjects, all of which are supported in the data. The vast majority of pupils are not seen by teachers as either aggressive or withdrawn. Two per cent of lowest Bore Score pupils are seen as very withdrawn or shy, three per cent of the highest Bore Score group are (3ii) (X^2 = 11.38, df = 6, p <.1). Nine per cent of the lowest Bore Score group are judged somewhat or very aggressive rising to sixteen per cent in the highest group (3iii) (X^2 = 21.62, df = 6, p <.005). Other 'withdrawal' measures show stronger associations. Fifteen per cent of highest Bore Score truant occasionally or frequently, only six per cent of the lowest (5ai) (X^2 = 56.42, df = 6, p <.001). Twenty three as opposed to thirteen per cent of those allowed to do so have already left school (5bi) (X^2 = 43.13, df = 3, p <.001), fifty nine per cent declare an intention to leave at fifteen compared with forty per cent in the lowest Bore Score group (5bv) (X^2 = 115.11, df = 6, p <.001).

The highest Bore Score group have a lower incidence of hard and very hard workers (3i) (thirty two versus forty eight per cent, X^2 = 96.28, df = 12, p <.001). The only index of aspiration is the taking of examinations. CSE (4ii) did not discriminate but whereas seventy three per cent of the highest Bore Scores were not taking any 'O' levels this was true of only fifty eight per cent of the lowest Bore Score group; twenty nine per cent of the latter were taking five or more 'O' levels, only sixteen per cent of the former (4i) (X^2 = 95.76, df = 27, p <.001). The teachers thought the most bored least capable: only thirty four per cent of the highest Bore Score being judged as capable of at least two 'O' levels as compared with the fifty per cent in the lowest group (4iii) (X^2 =77.60, df = 15, p <.001). Intelligence test scores from 'Eleven Plus' were available for only fifty three per cent of the sample. Within this sub-sample, thirty four per cent of the highest Bore Score had made scores of less than ninety five compared with twenty five per cent of the lowest Bore Score group (4iv) (X^2 = 25.98, df = 12, p <.025).

Fifty three per cent of the parents of the highest Bore Score group claimed that their offspring did a lot of schoolwork at home, but this rose to seventy one per cent in the lowest group (9xi) (X^2 = 85.9, df = 3, p <.001). Parents did not differ in their judgement as to whether their children should do (9xii) (X^2 = 3.55, df = 6, n.s.) more. An identical pattern emerged with reading by pupils. Forty two per cent of the most Bored group read nothing, according to their parents, contrasting with thirty one per cent of the least (X^2 = 29.54, df = 6, (9xiii) p <.001).

The highest Bore Score pupils were generally more hostile to school than the other groups. They did not look forward most days to going to school (6/1, X^2 = 121.32, df = 3, p <.001); they got fed up more often with teachers telling you what you can and can't do (6/2, X^2 = 120.21, df = 3, p <.001); they did not think the teachers took a great of interest in them or helped them a lot (6/4, X^2 = 160.87, df = 3, p <.001); more were delighted when they had an opportunity to take a day off school (6/5, X^2 = 187.38, df = 3, p <.001); more of them thought teachers forgot they were growing up (6/7, X^2 = 124.71, df = 3, p <.001); most of their friends were more likely to come from near home rather than from the school (6/8, X^2 = 16.8, df = 3, p <.001); fewer of them thought most school subjects to be useful (6/9, X^2 = 138.90, df = 3, p <.001). The differences between the bored and the not bored were substantial in size as well as statistically significant; there is a general disenchantment with school.

Alas, this appears to extend to spare time as well. Although the twenty six per cent of the highest Bore Score group who often get bored is not massively higher than the twenty per cent of the lowest group, it is significantly so (8) (X^2 = 17.26, df = 3, p <.001).

With the data to hand we cannot examine the extent to which boredom is linked to being a failure in a competitive system. Seventy nine per cent were in streamed classes compared with seventy four per cent of the lowest Bore Score group (2ii) (X^2 = 10.17, df = 3, p <.025), seventy one per cent were in classes where less than half the pupils were taking 'O' levels compared with fifty seven per cent of the lowest Bore Score group (2iii) (X^2 = 69.87, df = 9, p <.001). Both results are more consistent with the proposed idea than its reverse. Neither age (5biv) nor sex (5bvi) was associated with the Bore Score.

Of the factors likely to accentuate or attenuate boredom we have already shown that high Bore Scores are associated with perceived lack of teacher interest in the pupils, with the belief that teachers forget pupils are growing up, and with a resentment against teachers telling pupils what they can and cannot do. Whether such perceptions are veridical we cannot say. We have no independent estimates of teacher interest and we have no information about teachers' personal boredom with the subject they are teaching. We have teachers' estimates of parental interest. Thirty five per cent of the parents of the highest Bore Score group are reported as showing no interest compared with only twenty per cent in the lowest Bore Score group (1.ii) (X^2 = 68.58, df = 6, p <.001); neither parent of fifty one per cent of the highest Bore Score group had discussed their childs education compared with forty five per cent in the lowest group (1.iii) (X^2 = 16.00, df = 9, p <.10).

Parents were not asked directly about their concern about the education of their children. We have already seen that parents of the highest Bore Score group report a lower incidence in their children of reading and of schoolwork being done at home, but do not think more time should be spent on these activities. And yet ninety per cent of high Bore Score parents think reading is important, which is only slightly lower than the ninety three per cent of the lowest Bore Score group parents, (10i) (X^2 = 8.25, df = 3, p <.05). However, neither fathers (10i) (61% versus 68%, X^2 = 12.67, df = 3, p <.01) nor mothers (10i) (66% versus 70%, X^2 = 9.43, df = 3, p <.025) of the highest Bore Score group are as likely to claim they like reading themselves. Their homes are less likely to have books in them (10ii) (21% versus 13%, X^2 = 41.94, df = 6, p <.001).

On these weak indices, parents of the most bored are showing less interest in their children's education and are not so likely to be pro-education models for their children to follow. Parents of the highest Bore Score group are quite satisfied (9x) with the lower amount of time spent at home by their children (9ix) (X^2 = 16.36, df = 6, p <.025). They do not think their children help as much at home (9vii) (X^2 = 11.78, df = 6, p <.10) and are more dissatisfied by this (9viii) (X^2 = 19.71, df = 3, p <.001). Payment for keep and clothes buying did not relate to Bore Score (9ii, iii, iv, v).

Very few of the characteristics of the household were associated with the Bore Score. Thirteen per cent of the highest Bore Score pupils were from families with more than five compared with eight per cent from the lowest group (11ix) (X^2 = 29.14, df = 18,

$p < .05$). Over ninety per cent of households had both parents present, and there was only a weak tendency for high Bore Scores to be associated with households where only the father was present (11 vii) ($X^2 = 11.80$, df = 6, $p < .10$). The position of the pupil in the family (11x), whether parents were employed full-time, part-time, or not at all (11 iii & vi) whether parents were married, divorced, widowed, or single (11 ii & v), age of parents (11 i & iv) were severally irrelevant to the Bore Score.

Parental ownership of the home was associated with a low Bore Score (12i) ($X^2 = 15.39$, df = 6, $p < .025$), but the number of bedrooms it had was not (12 iii). However, having an excess of bedrooms over what was required was associated with low Bore Scores (12v) ($X^2 = 21.13$, df = 12, $p < .05$), as was living in a detached house (12 ii) ($X^2 = 28.24$, df = 12, $p < .01$). Since these differences are best expressed in terms of 'excess' going with an absence of boredom, it follows that within the limitations of this sample, poor material conditions were not conducive to high boredom with school subjects.

Most of the indices of the amount and type of education of parents and siblings give relationships with the Bore Score, but they are not of course independent of each other. To sort the important from the essentially irrelevant is not possible, but the differing strengths of association allow some estimate. Age at which father and mother completed school are more closely linked to Bore Score than are their qualifications or further education. Leaving at the statutory minimum provides the best single cut-off. Eighty-one per cent of the fathers of high Bore Score pupils left at fourteen compared with seventy four per cent in the lowest group (13 iii) ($X^2 = 28.17$, df = 9, $p < .001$); the figures for mother being eighty one per cent and seventy three per cent (13 v) ($X^2 = 22.78$, df = 9, $p < .01$). Type of school attended was more weakly associated, both Grammar and Private schools reducing the probability of the child being a high Bore Scorer (13 iv — fathers) ($X^2 = 13.64$, df = 6, $p < .05$) (13 vi — mothers) ($X^2 = 16.94$, df = 6, $p < .01$). Maternal further education and qualifications were not related to Bore Score at all.

And so to social class. Combined income of parents does not relate to Bore Score (14 ii) ($X^2 = 25.99$, df = 21, n.s.) and fathers' income only weakly so (14 i) ($X^2 = 31.81$, df = 21, $p < .10$), and that association is in the middle range. Very high income provides no immunity against, and very low income no propensity for, high boredom. Both indices of fathers' occupation do relate to Bore Score, the seven category split providing marginally more information than the traditional Registrar General classification. The significance overall (14 iv) ($X^2 = 49.98$, df = 18, $p < .001$) can be partitioned to show where the significant differences lie. There are no differences among classes 1, 2 and 3, the white collar jobs. Class 4 is overrepresented at Bore Scores between twenty one and thirty per cent ($X^2 = 4.99$, df = 1, $p < .05$). Class 5 is overrepresented in the highest Bore Score group relative to classes 1, 2, 3 and 4 ($X^2 = 4.91$, df = 1, $p < .05$); Classes 6 and 7 more strongly so (6 i) ($X^2 = 15.06$, df = 1, $p < .001$) (7: $X^2 = 12.24$, df = 1, $p < .001$). It is therefore the association between the highest Bore Score and having parents in semi-skilled and unskilled occupations that most makes the greatest contribution to the relationship.

5.2.5 Discussion

The results virtually speak for themselves. That so many of the scores from the three separate sources of teacher, parent and pupil relate so meaningfully to the Bore Score attests to the reliability and validity of this index, and the other scores as well. We can furthermore feel confident that the concomitants, antecedents and consequences of boredom with school subjects offered in Figure 5.1 are a reasonable representation of the dynamics proposed.

The most important general feature of the model is its emphasis on the interdependence of the factors. While it may be useful to ask about causes of boredom, it must be remembered that such factors may subsequently be affected by the boredom they created – giving the system a dynamic interdependence. It is a positive feedback model that reaches an unstable equilibrium only because other forces act to contain it. Escape for the bored pupil below the statutory school leaving age is not possible – the law and its sanctions presumably acting eventually as a major force to keep the bored pupil ticking over in the classroom.

Several points of minor significance may be noted. We had no information about the physical amenities of school, but might expect them to be of marginal relevance only in this regard. As in the work of Morton-Williams (1966), Wiseman (1966) and others, we find the material and financial conditions of the home to be of little import. It is the values, interests and behaviour of parents that is relevant.

We regret having no independent estimates of these same characteristics in teachers. In chapter 8 we find that variations in opinions and personality of teachers are associated with pupils' willingness to ask them questions of several types, but this may not be germane to the main issue of the consequences for pupils' interest of teachers being unconcerned to teach, and uninterested in the subjects they are teaching.

The relevance of parents and teachers as models for pupils should not be underestimated. The popular stereotype of rebellious youth despising authority in any form does not correspond to the facts. As Spencer (1972) shows in his study of attitudes of adolescents, the majority aspire to orthodox ways of leading satisfying lives and are content to endorse the values of parents and schools.

We might also mention the association between boredom and competition. Where competition between individuals is constructed and encouraged and where winning is rewarded, it is inevitable that there must be losers. And what are the chronic losers to do? Very few people will persist in playing at some game in which they invariably lose and yet we tolerate a situation in which children are consistently allowed to lose – every school day for perhaps ten years of their lives. That some children become very bored is not surprising; that their behaviour is generally so restrained is. What little evidence we have is consistent with the idea that inter-individual competition increases the likelihood of some children becoming bored (I have never understood why we are unable or unwilling to have intra-individual competitions arranged against time. Why do we fail to use the opportunity of showing children how they are progressing relative to themselves?).

While intelligence test scores at 'Eleven Plus' did relate to Bore Score, the association was much weaker than that between Bore Scores and present and predicted attainments. High I.Q. Scores seemed to provide some immunity from boredom, very low IQ (below 84) was not associated with boredom. Even if we were to concede that IQ scores were a measure of potential rather than an interaction of potential and opportunity taken, we could still argue that ability per se is not a very important predictor of boredom. Being bright helps to save, but being dim does not damn.

Such considerations as these seem to thrust the responsibility for initiating change on to adults rather than pupils. If we assume that pupils would rather not be bored – and to argue the contrary is probably a symptom of defensive mental acrobatics – we can see what changes need to occur. We have the power to reduce inter-individual competition and the chronic failure inherent to such a system. Parents and teachers could show more interest in the education of their charges.

We have means of diagnosing boredom. We can simply ask pupils whether or not they are bored. We can prevent boredom by showing pupils that what is being taught is valuable and useful.

And who is likely to say they are bored by a substantial amount of what they study in school? We should expect a relatively high incidence of such replies from lower working class pupils whose parents show little interest in education in general or the education of their own children in particular, and who themselves left school at the first opportunity. We should expect to find them in the lower streams of streamed schools: possibly schools were the emphasis is on 'O' level achievement and the lower streams do not take such examinations.

APPENDIX

The Bore Score was obtained by counting the number of subjects checked as 'Boring' expressed as a percentage of all subjects studied (5.2.1 Materials). These were banded to give four groups: 1. less than 11%; 2. 11 – 20%; 3. 21 – 30%; 4. 31% and greater.

Distributions which follow record raw number of pupils falling into the different response categories of other variables. The row labelled 'Residual' contains individuals not included in the statistical analysis for one of several reasons: no questionnaire, frequencies of the particular category were too rare to render inclusion sensible (*e.g.* neither parent resident at home had a frequency of only 2 for each Bore Score group), no answers and don't knows.

Data from Teachers' Questionnaire (SS 389A / *p.* 281)

	Bore Score				X^2	df	p	C
	1	2	3	4				
Questionnaire not obtained	19	21	18	9				
Questionnaires completed	1248	1284	1045	973				
1. Miscellaneous								
(i) Sex teacher								
Male	836	816	664	604	8.09	3	.05	.04
Female	355	403	344	328				
?	57	65	37	41				
(ii) Parental interest								
Very	302	304	228	160	68.58	6	.001	.14
Average	473	461	389	344				
Little or no	189	215	201	269				
Residual	284	304	227	200				
(iii) Parental discussion								
Both	260	284	214	170	16.00	9	.1	.07
Mother	230	240	203	192				
Father	83	75	57	47				
Neither	469	472	403	418				
Residual	206	213	168	146				
2. School and Class								
(i) Size class								
0 – 10	4	10	5	2	13.11	6	.05	.06
11 – 20	141	135	90	116				
21 – 30	517	583	483	417				
31 – 40	549	508	424	401				
41 – 50	12	11	5	8				
Residual	25	37	38	29				
(ii) Streaming								
Yes	915	959	812	760	10.17	3	.025	.05
No	326	319	228	207				
Residual	7	6	5	6				
(iii) a Proportion Class 'O' levels								
None	534	520	469	540	69.87	9	.001	.13
Less than half	141	149	111	118				
Half, but not all	148	161	100	73				
All	354	385	295	196				
Residual	71	69	70	46				

	Bore Score				X^2	df	p	C
	1	2	3	4				
(iii) Proportion class CSE								
b								
None	569	602	503	488	13.07	9	n.s.	.06
Less than half	249	254	208	209				
Half, but not all	215	197	161	135				
All	118	140	89	79				
Residual	97	91	84	62				
(iii) Proportion Class other								
c exams								
None	967	972	789	724	16.60	9	n.s.	.06
Less than half	86	96	86	105				
Half, but not all	53	54	43	45				
All	54	63	40	31				
Residual	88	99	87	68				
3. Attributes of Pupil								
(i) Industriousness								
Very hard worker	171	132	94	54	96.28	12	.001	.15
Hard	410	423	336	250				
Hard some subjects	158	202	158	139				
Moderate	366	373	313	359				
Lazy	103	120	118	148				
Residual	40	34	26	23				
(ii) Shy/Withdrawn								
Not or normal	885	953	743	684	11.38	6	.1	.05
Somewhat	305	261	249	228				
Very	27	28	32	32				
Residual	31	42	21	29				
(iii) Agressive								
Not or normal	1064	1052	858	765	21.62	6	.005	.07
Somewhat	99	147	130	131				
Very	12	14	10	13				
Residual	73	71	47	64				
4. Achievements and Ability								
(i) Estimated 'O' level sitting								
0	739	756	672	714	95.76	27	.001	.14
1	18	20	7	14				
2	31	30	26	24				
3	33	28	24	23				
4	30	53	26	16				
5	50	67	51	30				
6	86	66	46	36				
7	85	89	68	44				
8	136	131	92	58				
9	59	65	51	23				

	Bore Score				X^2	df	p	C
	1	2	3	4				
(ii) Estimated CSE sitting								
0	920	946	804	756	26.84	24	n.s.	.08
1	31	23	20	18				
2	31	52	30	25				
3	45	48	39	36				
4	48	59	47	46				
5	72	80	45	41				
6	65	51	43	34				
7	38	30	28	18				
8+	17	16	7	8				
(iii) Estimated Capability								
A levels	182	180	141	87	77.60	15	.001	.13
3+ 'O' levels	259	275	195	126				
Less than 3 'O' levels	150	153	122	93				
3+ CSE	204	201	155	164				
Less than 3 CSE	150	172	143	144				
Less able	249	242	234	279				
Residual	54	61	55	80				
(iv) IQ at 11 plus								
121 +	71	72	61	38	25.98	12	.025	.11
106 – 120	200	195	151	125				
95 – 105	162	155	131	136				
85 – 94	78	94	78	105				
84 –	70	52	57	55				
No data	667	715	567	518				

5a. Actions of Pupil

(i) Truancy								
Frequent	12	16	18	19	55.42	6	.001	.11
Occasional	61	76	86	118				
Never	1114	1124	883	770				
Residual	61	68	58	66				

Data from Pupils' Questionnaire (SS 389 Y p. 257 – 280)

	Bore Score				X^2	df	p	C
	1	2	3	4				
Questionnaire not obtained	0	0	0	0				
Questionnaire completed	1267	1305	1063	982				
5b. Actions & Attributes of Pupil								
(i) Still at school								
No	167	190	178	225	43.13	3	.001	.10
Yes	1100	1115	885	757				
(ii) Leavers: Date of leaving								
Easter '65	56	46	46	70				
July '65	97	114	105	132	10.01	6	n.s.	.12
Easter '66	4	15	16	15				
Residual	9	15	10	7				
(iii) Year of Schooling								
3rd	469	408	370	323				
4th	394	431	359	343	59.97	6	.001	.12
5th	237	276	156	89				
Residual	0	0	0	2				
(iv) Age								
13	233	208	177	160				
14	431	414	370	325				
15	373	431	351	322	12.17	9	n.s.	.05
16	226	241	161	171				
Residual	4	11	4	4				
(v) Intended/Actual Leaving Age								
15	485	511	467	568				
16	370	424	305	240				
17+	364	349	266	153	115.11	6	.001	.16
Residual	48	21	25	21				
(vi) Sex								
Male	643	647	510	469	2.74	3	n.s.	.02
Female	624	658	553	513				
6. Attitudes to School								
Q1. Days look forward school								
Yes	879	802	602	468	121.32	3	.001	.16
No	368	480	452	504				
? or no answer	20	23	9	10				
Q2. Fed up teachers telling								
Yes	735	865	771	780	120.21	3	.001	.16
No	509	421	284	198				
? or no answer	23	19	8	4				

	Bore Score				X^2	df	p	C
	1	2	3	4				
6. cont'd.								
Q3. School same day after day								
Yes	490	629	571	644	166.16	3	.001	.19
No	765	667	483	333				
? or no answer	12	9	9	5				
Q4. Teachers interested								
Yes	1018	929	710	567	160.87	3	.001	.19
No	194	303	308	373				
? or no answer	55	93	45	42				
Q5. Happy to stay away								
Yes	264	370	348	465	187.38	3	.001	.20
No	970	908	699	498				
? or no answer	33	27	16	19				
Q6. School interesting								
Yes	915	807	604	436	195.24	3	.001	.20
No	327	472	444	533				
? or no answer	25	26	15	13				
Q7. Teachers forget growing up								
Yes	467	567	487	593	124.71	3	.001	.16
No	760	699	557	369				
? or no answer	40	39	19	20				
Q8. Friends from home								
Yes	479	495	430	446	16.28	3	.001	.06
No	750	767	612	510				
? or no answer	38	43	21	26				
Q.9 School useful								
Yes	1167	1123	875	728	138.90	3	.001	.17
No	87	171	178	235				
? or no answer	13	11	10	19				
7. Uselessness of School subjects								
0 – 9%	629	354	186	91	945.85	9	.001	.41
10 – 19%	408	521	363	211				
20 – 29%	144	271	275	260				
30 and more %	86	159	239	420				
8. Boredom in Spare Time								
Usually enjoys	1010	1003	780	727	17.26	3	.001	.06
Often bored	253	302	283	254				
Residual	4	0	0	1				

Parents Questionnaire (SS 389/P p. 283 – 308)

		Bore Score				X^2	df	p	C
		1	2	3	4				
Questionnaire not obtained		36	27	24	23				
Questionnaire completed		1194	1241	1013	937				
9. Parent Report on Pupil									
Leavers items 9(i) – (v) omitted. No hint of significance									
(vi)	Should help in house?								
	Yes	1137	1176	970	888	1.43	3	n.s.	.02
	No	56	65	43	48				
	*Residual	37	27	24	24				
	If yes to (vi)								
(vii)	Helps in house?								
	A lot	546	495	412	384	11.78	6	.10	.05
	A little	525	607	491	440				
	Never	63	70	65	62				
	*Residual	96	96	69	74				
(viii)	if Yes to (vi) Helps enough?								
	Yes	869	832	675	607	19.71	3	.001	.07
	No	265	339	293	277				
	*Residual	96	97	69	76				
(ix)	Spare Time								
	At home	860	831	710	642	16.36	6	.025	.06
	Elsewhere	136	185	152	151				
	Equal	194	221	149	142				
	*Residual	40	31	26	25				
(x)	Satisfaction with (ix)								
	Yes	975	1010	807	769	2.44	3	n.s.	.02
	Not entirely	214	227	204	166				
	*Residual	41	31	26	25				
(xi)	Home time on schoolwork								
	Some	843	860	642	498	85.89	3	.001	.14
	None/hardly any	348	378	368	437				
	*Residual	39	30	27	25				
(xii)	If some to (xi) Evaluation								
	Should be more	154	147	119	100	3.55	6	n.s.	.04
	Should be less	97	101	69	65				
	About right	578	603	450	331				
	*Residual	401	417	399	464				

		Bore Score				X^2	df	p	C
		1	2	3	4				
(xiii)	Amount of time pupil needs								
	A lot	402	371	294	251	29.54	6	.001	.08
	Moderate amount	427	428	345	297				
	None/hardly any	365	441	374	389				
	*Residual	36	28	24	23				
(xiv)	Evaluation (xiii) if any								
	Should spend more	177	163	117	107	3.37	6	n.s.	.04
	Should spend less	25	31	23	22				
	Spends right amount	615	597	491	412				
	*Residual	413	477	406	419				
(xv)	Reading important								
	Yes	1102	1140	912	839	8.25	3	.05	.04
	No	85	89	95	91				
	*Residual	43	39	30	30				
10.	**Parents' Behaviour**								
(i)	Likes reading, father								
	Yes	758	772	612	529	12.67	3	.001	.06
	No	354	409	327	345				
	*Residual	118	87	98	86				
(ii)	Likes reading, mother								
	Yes	826	872	674	603	9.43	3	.025	.10
	No	356	349	324	315				
	*Residual	48	47	39	42				
(iii)	Number books in home								
	More than 5	926	975	748	650	41.94	6	.001	.10
	1 – 5	116	113	107	90				
	0	149	152	155	196				
	*Residual	39	28	27	24				
11.	**Household Characteristics**								
(i)	Mothers' Age								
	30 – 39	363	387	317	295	1.24	6	n.s.	.02
	40 – 49	632	644	532	494				
	50 – 59	173	175	136	123				
	*Residual	62	62	50	48				
(ii)	Mothers' Marital Status								
	Married	1105	1160	930	862	4.57	3	n.s.	.03
	Widowed, divorced, single	77	58	66	55				
	*Residual	48	50	41	43				

		Bore Score				X^2	df	p	C
		1	2	3	4				
(iii)	Mothers' employment								
	Full-time	252	261	240	207	6.08	6	n.s.	.04
	Part-time	358	393	321	293				
	None	572	564	435	417				
	*Residual	48	50	41	43				
(iv)	Fathers' Age								
	30 – 39	179	196	152	145	5.02	6	n.s.	.03
	40 – 49	630	678	529	524				
	50 – 59	257	272	233	179				
	*Residual	164	122	123	102				
(v)	Fathers' Marital Status								
	Married	1099	1158	926	857	3.5	3	n.s.	.03
	Widowed, divorced, single	12	22	15	18				
	*Residual	119	88	96	85				
(vi)	Fathers' Employment								
	Full-time	1069	1148	911	848	3.81	3	n.s.	.03
	None	41	28	27	23				
	Part-time	1	4	27	23				
	*Residual	119	88	96	85				
(vii)	Parents in Household								
	Both	1102	1161	926	859	11.80	6	n.s.	.05
	Mother only	80	57	70	58				
	Father only	10	21	15	18				
	Neither	2	2	2	2				
	*Residual	36	27	24	23				
(viii)	Children in Family								
	1	149	149	119	102	29.14	18	.05	.08
	2	397	403	319	263				
	3	277	292	258	247				
	4	167	172	134	130				
	5	104	86	71	69				
	6 or 7	65	95	69	74				
	8 +	35	42	42	52				
	*Residual								
(ix)	Position of child in family								
	1st	367	388	320	254	12.00	12	n.s.	.06
	2nd	386	375	310	307				
	3rd	169	178	151	155				
	4th	66	86	61	62				
	5th	57	65	52	57				
	*Only and Residual	185	176	143	125				

		Bore Score				X^2	df	p	C
		1	2	3	4				
(x)	Mothers' Daily Absence								
	Home all day	606	602	490	447	4.72	9	n.s.	.09
	Out less than 5 hours	227	255	207	197				
	Out 5 – 10 hours	292	312	257	244				
	Out more than 10 hours	37	29	31	22				
	*Residual	52	53	41	45				
12.	**Characteristics of House**								
(i)	Ownership								
	Owned	470	499	391	318	15.39	6	.025	.06
	Rented	686	704	598	598				
	Rent free	38	38	23	19				
	*Residual	36	27	25	25				
(ii)	Number of Bedrooms								
	1	4	5	4	2	9.57	6	n.s.	.05
	2	201	181	167	137				
	3	824	873	681	681				
	4 or more	164	181	161	117				
	*Residual	37	28	24	23				
(iii)	Bedrooms Needed								
	2	367	401	311	252	10.24	6	n.s.	.05
	3	564	560	453	449				
	4	263	280	249	236				
	*Residual	36	27	24	23				
(iv)	Bedroom Shortfall								
	Two or more below	51	71	66	55	21.13	12	.05	.07
	One too few	227	210	179	186				
	Equal	600	603	500	490				
	One excess	269	307	229	184				
	Two or more excess	44	47	38	21				
13.	**Education Siblings and Parents**								
(i)	Siblings at Comprehensive?								
	Yes	97	127	84	84	4.00	3	n.s.	.03
	No	935	956	802	742				
	*Not applicable/ residual	198	185	151	134				
(ii)	Sibs at Selective secondary								
	Technical, Grammar, Public	339	370	279	234	8.25	3	.05	.05
	Other	695	710	607	594				
	*N/A & residual	196	188	151	132				

		Bore Score				X^2	df	p	C
		1	2	3	4				
(iii)	Age leaving School Father								
	14	852	896	771	731	28.17	9	.001	.08
	15	111	114	69	74				
	16	113	91	78	53				
	17+	77	95	52	47				
	Residual	77	72	67	55				
(iv)	Age leaving School Mother								
	14	872	941	772	751	22.78	9	.01	.07
	15	155	117	104	90				
	16	96	105	83	55				
	17+	65	69	45	35				
	Residual	42	36	33	29				
(v)	Type School Father								
	Sec. Mod.	834	885	740	709	13.64	6	.05	.06
	Grammar	144	152	105	83				
	Private	52	54	36	27				
	Others	129	115	93	87				
	Residual	72	62	63	54				
(vi)	Type School Mother								
	Sec. Mod.	863	912	754	730	16.94	6	.01	.07
	Grammar	123	126	82	72				
	Private	66	60	56	29				
	Others	131	133	109	99				
	Residual	47	36	36	30				
(vii)	Qualifications Father								
	None	864	899	746	729	15.25	6	.025	.06
	Degree, Diplomas, Certs > 'O'	92	95	76	55				
	'O' levels and equivalents	179	191	125	105				
	Others	50	47	53	40				
	Residual	45	35	37	31				
(viii)	Qualifications of Mothers								
	None	1022	1065	870	832	10.03	6	n.s.	.05
	Degree, Diplomas & Certs > 'O'	49	46	30	20				
	'O' levels & equivalents	119	124	101	76				
	Others	2	6	6	6				
	Residual	38	32	29	26				

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*Includes the number of questionnaires not obtained as well as other residual categories.

		Bore Score				X^2	df	p	C
		1	2	3	4				
(ix)	Further Educ. Father								
	None	785	831	677	663	15.77	9	<.10	.06
	University, College	74	73	46	36				
	Apprenticeship	185	183	168	135				
	Part-time/Correspond.	114	120	80	71				
	Other	30	28	34	27				
	Residual	42	33	32	28				
(x)	Further Educ. Mother								
	None	1001	1027	864	806	12.31	9	n.s.	.05
	University, College	73	76	50	44				
	Apprenticeship	23	16	16	18				
	Part-time/Correspond.	95	116	73	61				
	Other	0	3	5	4				
	Residual	38	30	29	27				

14. Income and Social Class

S

		1	2	3	4	X^2	df	p	C
(i)	Income, Father								
	< £7½/week	32	22	23	25	31.81	21	.10	.09
	7½ – 10	51	46	48	44				
	10 – 12½	118	112	97	107				
	12½ – 15	190	231	185	197				
	15 – 20	348	365	301	281				
	20 – 25	198	204	150	103				
	25 – 30	79	89	72	64				
	30 +	84	90	69	53				
	Residual	130	109	92	86				
(ii)	Income, Combined								
	< £7½	31	20	25	23	25.99	21	n.s.	.08
	7½ – <10	45	34	33	31				
	10 – <12½	68	63	63	70				
	12½ – <15	130	148	125	119				
	15 – <20	296	326	252	251				
	20 – <25	281	274	200	192				
	25 – <30	134	167	146	108				
	30 +	133	142	113	89				
	Residual	112	94	80	77				

		Bore Score				X^2	df	p	C
		1	2	3	4				
(iii)	Social Class (Registrar General)								
	I Professional	31	43	31	20	42.13	15	.001	.10
	II Intermediate	193	195	168	129				
	III None-manual skilled	134	144	74	81				
	III Manual skilled	537	525	454	393				
	IV Semi-skilled	221	262	211	227				
	V Unskilled	66	61	60	78				
	Unclassified	6	4	6	3				
	Residual	42	34	33	29				
(iv)	Socio-economic Groupings See text								
	1 (1, 3, 4, 16)	89	111	75	67	49.98	18	.001	.11
	2 (2, 5, 13)	173	167	134	92				
	3 (6)	118	119	71	76				
	4 (8, 12, 14) Foremen	144	142	136	93				
	5 (9, some 16) skilled	394	399	341	308				
	6 (7, 10, 15) semi-skilled	199	237	184	215				
	7 (11) Unskilled	65	55	59	77				
	8 Unclassifiable	6	4	5	3				
	Residual	42	34	32	29				

Partition of X^2 for Socio Economic Grouping against Boredom Index

	Source		
Boredom Group	Socio-Economic Groups	X^2	p
1 v 2	1 v 2	2.17	
12 v 3	1 v 2	0.08	
123 v 4	1 v 2	1.41	
1 v 2	12 v 3	0.12	
12 v 3	12 v 3	2.47	
123 v 4	12 v 3	0.84	
1 v 2	123 v 4	0.17	
12 v 3	123 v 4	4.99	<.05
123 v 4	123 v 4	0.00	
1 v 2	1234 v 5	0.02	
12 v 3	1234 v 5	1.21	
123 v 4	1234 v 5	4.91	<.05
1 v 2	12345 v 6	1.94	
12 v 3	12345 v 6	0.12	
123 v 4	12345 v 6	15.06	<.001
1 v 2	123456 v 7	1.14	
12 v 3	123456 v 7	1.09	
123 v 4	123456 v 7	12.22	<.001

df = 1 in every case

5.3 REFERENCES

Morton-Williams, R. The 1964 National Survey: Survey among parents of primary school children. In Central Advisory Council for Education (England) (B. Plowden) *Children and their primary schools.* London: Her Majesty's Stationery Office. 1966.

Morton-Williams, R. and Finch, S. *Young school leavers;* Schools Council Enquiry 1. London: Her Majesty's Stationery Office.

Spencer, C.P. Selective secondary education, social class and the development of adolescent subcultures. *Brit.J.Ed.Psychol.,* 1972, *42,* 1–8.

Wiseman, S. *Education and environment.* Manchester: Manchester University Press, 1964.

CHAPTER 6 QUESTIONS ASKED AND SOCIAL CLASS (G.V. PROSSER)

6.1 INTRODUCTION

6.2 METHOD

6.3 RESULTS AND DISCUSSION
6.3.1 School A
6.3.2 School B

6.4 SIMPLIFICATION OF THE QUESTION TAXONOMY
6.4.1 Principal Component and Factor Analysis
6.4.2 Simplified Flowchart

6.5 SUMMARY AND GENERAL DISCUSSION

6.6 REFERENCES

CHAPTER 6

QUESTIONS ASKED AND SOCIAL CLASS (G.V. PROSSER)

Editor's Introduction. In the autumn of 1968, flush with the prospect of three full years in which to collect hard data that could serve as a basis for the description of the educational needs both to stimulate and maintain curiosity and to equip children with the verbal skills to acquire and evaluate knowledge, the Project Director demanded a census of questions that secondary school children have.

If the theoretical position, presented at the end of chapter 2, about differences between the social classes is valid, then WC secondary children should be less curious that MC children about their environment and hence should have fewer questions about it. In so far as their skills in the representational use of language and their general knowledge about the work are also depressed, their questions should also be different in quality from those of their MC peers. The results mentioned in chapter 5 support the view of differential boredom. The results mentioned in section 1 of chapter 4 point to relationships between maternal tactics of answering questions and the questioning and answering of young children that are consistent with the general thesis, and as we shall see in chapter 7, similarly consistent social class differences appear in the questions of children up to the age of ten.

But are there social class differences in the quantity and quality of the questions that older, fourteen year old, children have? The data in succeeding pages are intended to throw some light on this question.

How to collect the questions of fourteen year old children was not immediately obvious. In the first place we did not wish to restrict the topics of questions to highly circumscribed school-based subjects. In the second we wanted to ensure that our materials and contexts merely elicited questions and did not stimulate new ones. In the third, we found ourselves on the horns of a dilemma – if pupils were truly and chronically bored would they even co-operate in our investigations? This was not so much a practical worry about the behaviour of children, as a worry about theoretical adequacy. On the reasoning presented in chapter 2, the truly bored would presumably just not be interested in taking part in any investigation. But pupils in school were unlikely to be as uncooperative as that (in our case such virtue was a handicap). Overt rebellion is hazardous. If one applies a combination of 'minimizing misery' and a 'least effort' principles, the bored should conform to demands for questions by producing them. It might, of course, be even more boring just to sit doing nothing. Questions produced might therefore signify nothing more than a mechanical willingness to conform.

To explore the dilemma we thought it best to take the devil by the horns between which we were trapped and talk the problem over with the fourteen year olds already mentioned in chapter 4. Neither this venture nor our Youth Club enterprises helped to answer our questions about research technology.

Discouraged somewhat by the impotence of our imaginations to generate an all-purpose general question elicitation instrument, we fell back upon orthodox simple-mindedness: we provided pupils with a range of topics about which they could ask questions, some of which would be subsequently answered. The pilot study in School A served several functions: it provided questions upon which a taxonomic scheme could be developed and, in spite of the dearth of MC pupils, there were encouraging hints of social class differences.

The gambler's statistically correct preference to stay with a winning number led us to repeat our orthodoxy in schools more heterogeneous in social class intake. Of three schools in the area which had a sufficient incidence of MC pupils to merit approach, two were unwilling to discuss the possibility of our enquiry taking place. The third school, School B, allowed us in, but then constrained any development of our enterprise beyond group administration for one double period. A fourth school that might have been suitable replied, 'I think sometimes we are fighting what could be a "losing battle" in our schools to get on with what is obviously our major task – to educate the children. Exercises of the kind you suggest may be of interest to you but as far as we are concerned they are a sheer waste of time . . .'.

Somewhat put off by our lack of credibility, we consoled ourselves by thinking out good theoretical grounds why the information derived from School B was sufficient to our needs.

6.1 Introduction

A number of factors might be expected to operate to determine the quantity and quality of questions asked by children. Once the excitement of hearing their offspring's first words has passed, parents are made increasingly aware of pressure to answer questions. Reactions to this questioning activity may range from pleasure in the child's thirst for knowledge to irritation at what appears to be little more than a demand for attention. At either extreme, certain assumptions are made regarding questions. In the first place it is assumed that questions are asked in order to obtain information. A second assumption is that questions may be used for manipulative purposes. As Robinson and Rackstraw (1972) point out, questions may serve a variety of purposes. They may be used:

> 'to test authority, to register a protest, to evoke embarrassment or other emotional states, to prevent an uncomfortable silence, or as a rhetorical device' (*id.* chapter 2)

This means that both motivational and cognitive factors have to be taken into account when considering the determinants of question asking, and when considering what form the questions might be expected to take.

If children are encouraged to ask questions, they will presumably not only be more likely to do so, but the quality of their questions should improve with practice. Conversely, if children find that the asking of questions is not rewarded, either by approval or by suitable answers, they will ask fewer questions, be less skillful in formulating questions and in consequence of this will be even less likely to ask questions. This vicious circle may be observed in the context of both home and school. The individual child at home will be largely dependent upon the encouragement received from his parents. In such a case, there is a one-to-one relationship, and the foundations are laid for individual differences in question asking. At school, however, the child is set within the context of a social situation. Each school has its norms, and so has each classroom within the school. Much will depend upon individual teachers, and more will depend upon the interactions between teacher and class that are customary in any particular school. At school, individual differences may be obscured. It is possible that only the 'best' and the 'worst' pupils experience a one-to-one relationship with the teacher.

Pupils with a high verbal IQ might be expected to ask more questions simply because they have a readier access to the teacher. They have more in common with the teacher. For the same reason, children of MC parents should find it easier to communicate with the teacher by means of questions. But in spite of this, both high ability pupils and MC pupils may find it more convenient to accept the norms of the majority of the class. This would apply particularly to older pupils, who are more sensitive to peer approval and disapproval. All things being equal, however, we might expect that more capable children will frame questions of higher quality, and that the ability to ask suitable questions will develop with experience. The Bernstein hypothesis predicts that children of MC families will have the advantage of more experience in asking, and receiving answers to, questions.

In chapters 2 and 3 of this report, a fuller review of theory and research relating questions to curiosity and social class has been given. In view of some uncertainty about the construct itself, it is not easy to decide whether curiosity acts as the independent variable. In so far as the word 'curiosity' applies to a range of behaviours, it is possible to consider the problem of eliciting curiosity by appropriate stimuli. If, however, the emphasis is upon curiosity as a motivational or personality state, the problem of measuring or indicating its presence becomes appropriate. In relation to curiosity, questions may be considered as dependent upon this motivational or personality state, and thus serve as a measure of curiosity. On the other hand, questions may be regarded as an example of curiosity behaviours. In such a case, both questioning and curiosity can be regarded as dependent variables, elicited by appropriate stimuli, or expressing some underlying personality or motivational state.

In the literature, the tendency has been to regard questions as the dependent variable, offering a measure of curiosity. In Berlyne's (1954) study, questions served both to stimulate curiosity and to indicate the presence of curiosity. Ashton (1965) considered that children who asked more questions, and who also had a tendency to form more hypotheses regarding stimulus objects, were more curious. When Berlyne and Frommer's (1966) subjects responded to 'curiosity-arousing' stimuli by producing more questions, this was taken to mean that their curiosity had in fact been aroused. Maw and Maw's (1968) 'high' curiosity subjects asked more questions, and Rosenshield's (1968) 'high' curiosity group asked their questions about topics with which they were presently unfamiliar. That is to say their curiosity was aroused by the unfamiliarity of the material, and their questions served to indicate this. (For references, see chapter 2.)

In attempting to relate the construct of curiosity to social class as well as to the asking of questions, a difficulty arises. If it is assumed that the children of MC parents have been rewarded for showing curiosity, they might be expected to ask more questions in situations where their curiosity is aroused. But the literature seems to suggest that the arousal of curiosity is itself not independent of such factors as the nature of stimulus material, and the extent to which it offers something new, unexpected or unusually complex in relation to the subject. What is unexpected for the child of LWC parents may turn out to be familiar and wholly predictable for the child of MC parents. This could have the effect of inhibiting the asking of questions. It might tax the resources of the child to attempt a new question about an old situation, and this could be reflected in the quality of questions asked, but it does seem that studies in this field will need to look for interaction effects if any generalisations are to become possible.

6.2 Method

Subjects. Two neighbourhood creamed comprehensive schools were visited. The Hall-Jones scale of occupational prestige was used in order to determine a social class rating for each pupil. The father's social class was usually taken, but where this could not apply, the mother's social class was taken. The two schools clearly differed in distribution of social class members. The catchment areas were different. School A was situated in a down-town area. The premises were old and unattractive. The school was divided into several sections situated at points separated by as much as a quarter of a mile. Pupils were often required to walk this distance between lessons, time being allowed for these journeys. An appreciable number of pupils were Pakistani and other immigrants. In spite, however, of these difficulties, a keen interest in social welfare and other extra-curricular activities was apparent.

Information regarding social class was available for forty four out of sixty two pupils considered in this school. In consultation with members of staff, it was also possible to grade the streets from which pupils came. Streets assigned a C grading had a high proportion of immigrants. Streets assigned D grading were known to have a number of houses of ill-repute. None of the pupils belonged to social classes 1 and 2, but when the frequencies of pupils in classes 3 – 5 and 6 – 7 were set in a contingency table under the street ratings A–B and C–D respectively, a chi-squared value of 4.51 was obtained ($p < .05$). This suggested an association between social class and street rating significant at that level. A contingency coefficient computed according to principles suggested by Siegel (1956) gave a value of 0.31 (significant at the level of the chi-squared value *viz.* five per cent).

School B was situated in an upper working-class/middle class area. The buildings were new and attractive. This school appeared to be nearer the comprehensive school pattern in that a serious attempt was made to avoid streaming. Where streaming occurred, it was usually by subject, so that members of the same school class would be attending different subject classes at any given time. There was, furthermore, an interesting tutorial scheme in operation, whereby small groups of pupils were allocated to general tutors, and were the special responsibility of these tutors throughout their school career. Local authority arrangements permitted of the existence of both grammar and comprehensive schools, and there was some evidence of feeling in School B that some of their best pupils had been 'creamed off' by a certain prestigious grammar school in the area.

When frequencies of pupils in social classes 1 – 5 and 6 – 7 were compared in a contingency table, School B was found to have a greater proportion of class 1 – 5 pupils. (Ninety seven out of a total of 125, whereas in School A half of the pupils, *i.e.* thirty one out of a total of sixty two were in this class.) This table gave a chi-squared value of 14.6 (13.37 using Yates' correction, $p < .001$). In the case of School A, social class details were completed by interpolation on the basis of home address. If this had not been done, the chi-squared value would have been even greater *i.e.* giving an even smaller probability value, just over one third of the pupils belonging to social classes 1 – 5.

Fourth form pupils were used in both schools, their ages ranging from 13.6 to about 14.6. Girls and boys attended School A. School B was a boys' school.

The responses of twelve girls were coded. Six of the girls were from social classes 6 – 7 of the Hall-Jones scale, and for purposes of analysis were regarded as the 'low' class group. The remaining girls were regarded as the 'high' class group. The two groups were matched on scores obtained on the Mill Hill vocabulary scale.

Questions were elicited from 145 boys in school B. Sixteen boys were excluded since, according to their tutors, they had special family and other problems. Particulars of social class were not available for a further four boys.

From the remaining 125 boys selection was made of those suitable for inclusion in four social class groups, matched for ability and attainment. This matching was possible on the basis of information given in school records regarding subject stream. In order to facilitate high-low social class comparison, fifteen boys were assigned to each of four social class groups, viz. 1 – 4, 5a, 5b, and 6 – 7 of the Hall-Jones scale. The responses of thirty boys only were coded, from the highest (1 – 4) and lowest (6 – 7) groups.

Selection of subjects was made according to the following principles:

1. Boys' names were taken from stream lists in alphabetical order.
2. For group 1–4, the highest class was chosen in order to sharpen the high-low distinction.
3. The father's social class, which was always either superior or equal to the mother's, was usually taken. The only exception occurred in the 6 – 7 group. The widowed mother was a cleaner (class 7).
4. In group 6–7, approximately equal numbers were chosen from each class, although there were in fact twice as many class 6 as class 7 boys in the fourth form of this school.

Procedure. Pupils were seen together. In order to prevent communication between the different school classes, members of the research team visited the school at the same time, divided themselves among the classes, and elicited questions from the pupils during the same lesson period.

An explanation was given in terms approximating to the following form:

> 'You are used to being asked questions in tests and examinations, but we at the University are interested in the questions that you yourselves might like to ask. One of the reasons why we are doing this is because it can help in the planning of school programmes. All you will have to do is to write down questions about the topics we write on the blackboard. Remember that this is not a test. We will not tell anybody at the school what you have written. It will help us while completing our records to know your names, but once your questions reach the analysis stage your names will not be used, only numbers.'

Once this general explanation was given, more particular instructions were given. Paper was supplied to all pupils, and where pencils were needed, these were handed out. Pupils were instructed to ask for a fresh pencil if a point should break or if a pen should run dry. When these preliminaries were completed, the instruction:

> 'Write your name at the top of the sheet of paper.'

was given. The pupils were told,

> 'I shall write a topic (subject) on the blackboard. As soon as I do this, you can write the name of somebody you would like to answer your questions. Then please write your questions, and go on writing until I tell you to stop and then I will write another topic on the blackboard. You will have about five minutes for each topic.'

Questions were elicited on the following topics:

SPORT
RIGHT AND WRONG
EDUCATION
THE POLICE
THE FUTURE
RELIGION
PROBLEMS OF TEENAGERS
POLITICS

MY FUTURE
SCIENCE

DOCTORS AND NURSES

The scripts were collected after making sure that the pupils' names had been written on them. The pupils were then thanked for their co-operation.

Coding procedure: taxonomy of questions. In order to score the questions which had been elicited, a taxonomy of questions was produced extending and developing ideas advanced by Robinson and Rackstraw (1972). This followed the pattern of an algorithm or flow chart in the hope that such a scheme would have sufficient clarity of definition for high inter-scorer reliability. A Scoring Manual was developed jointly with Duffy while the taxonomy was being used to score the questions of the twelve girls in school A. This also gave an opportunity for a preliminary testing of inter-scorer reliabilities. When the questions of the thirty boys in school B were scored, inter-scorer reliabilities were retested.

The Taxonomy and Scoring Manual comprise nine basic dimensions, each with a number of categories (eighty one in all). The nine dimensions, A – I, fall into three divisions, *viz.* Form, Intention and Content. Under J, which may be regarded as a tenth dimension, the total number of words is recorded. The divisions, dimensions and categories are, for the most part, logically based, and it is not claimed that they will turn out to be factorially or behaviourally meaningful.

1. Form
   - A. Is the Response a Question?
   - B. Syntactic Structure of Question : Complexity;
   - C. Form of Question : Open/Closed

If a response has been made, its form is considered. Questions, question equivalents, statements and statement equivalents are characterized.

Questions may be simple or complex; and the main criteria for complexity include use of the subordinate and co-ordinate clauses of traditional grammar.

Open and closed questions are considered, and the extent to which questions are used for hypothesis testing, or to make statements, may be inferred from this.

2. Intention
   - D. Attitude Expression
   - E. Suggestion of Answer
   - F. Seeking of Opinion or Information

Questions may be used for manipulative purposes. Requests may be made: friendly or hostile attitudes may be expressed. Agreement with a point of view may be sought; and the questioner may suggest what the answer should be. An opinion may be requested rather than factual information.

3. Content
   - G. Referential
   - H. Personal References
   - I. Abstractness

Questions may be concerned with placing, description or explanation. Personal references are recorded and classified. Each question is finally placed on a scale moving from the particular and concrete towards the general and abstract.

Since the Flow Chart and Scoring Manual occupy nearly forty pages of typescript, with a liberal use of expensive-to-print boxes and arrows, its description is confined to a listing of the eighty one categories.*

A. Response – Question : 1, No response (implied); 2, No response (stated); 3, Problem not understood (stated); 4, Incomplete question (nonsensical); 5, Problem not understood (implied); 6, Question produced; 7, Question Equivalent (request); 8, Question equivalent (command); 9, Statement equivalent (imperative form); 10, Question equivalent (statement of uncertainty); 11, Statement (complex); 12, Statement (simple).

B. Complexity of Question : 1, Multiple question; 2, With subordinate clause; 3, With co-ordinate clause; 4, With statement; 5, With compound group (nominal, verbal, adverbial); 6, Simple question.

C. Open – Closed Question : 1, Open; 2, Closed common inversion, personal; 3, Closed – common inversion, impersonal; 4, Closed – particular inversion; 5, Closed (statement form with ?); 6, Closed – interrogative marker word; 7, Closed – other.

D. Attitude of Question : 1, Manipulative – both attitude expression and request; 2, Manipulative – friendly; 3, Manipulative – hostile to test situation, indirect; 4, Manipulative – hostile to test situation, direct; 5, Manipulative – hostile to topic, indirect; 6, Manipulative – hostile to topic, direct; 7, Manipulative, positive request; 8, Manipulative – negative request; 9, Reduction of uncertainty.

E. Answer Suggestion : 1, Suggesting answer; 2, Possibly suggesting answer; 3, Suggesting alternatives, 4, Answer free from suggestions.

F. Opinion or Knowledge : 1, Seeks opinion; 2, Seeks information.

G. Referential Category : 1, Placing – personal object agent; 2, Placing – impersonal object agent; 3, Placing – personal object category; 4, Placing - action; 5, Placing – personal object identity; 6, Placing – substance object category; 7, Placing – substance object identity; 8, Placing – impersonal object category; 9, Placing – impersonal object identity; 10, Placing – space, self related; 11, Placing – space, other related; 12, Placing – space, absolute; 13, Placing – time self related; 14, Placing – time, other related; 15, Placing – time, absolute; 16, Description – comparison; 17, Description, degree; 18, Description, state; 19, Description, process/method; 20, Description, manner; 21, Explanation, function/purpose; 22, Explanation, categorisation/essence; 23, Explanation, cause; 24, Explanation, consequence; 25, Explanation, other.

H. Personal Reference : 1, Impersonal; 2, I; 3, We; 4, You; 5, He, she, they; 6, Self; 7, Own group; 8, Other group; 9, Society.

I. Abstractness : 1, Immediate; 2, Restricted; 3, Particular, direct; 4, Particular, associated; 5, General; 6, Abstract.

J. Number of Words

6.3 Results and Discussion

6.3.1 Results : School A

It was possible to trace a profile for each of the two groups of six girls by expressing scores as percentages of the questions asked under each of the nine main dimensions. For each dimension, one measure only is offered in the analysis; and the measure is selected in such a way that in each case the prediction that MC subjects (social class groups 1–5) will obtain a higher percentage than WC subjects (social class groups 6, 7) is tested.

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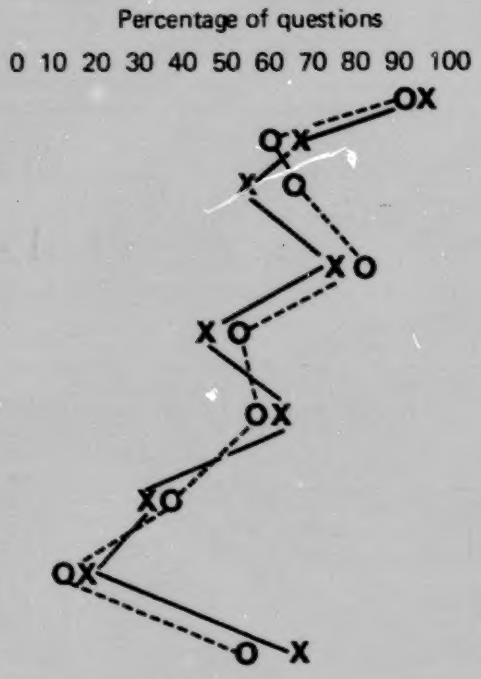
*Copies are available from Dr. G.V. Prosser, Department of Psychology, Keele University, Keele, Staffordshire.

The dimensions and measures are as follows:

Dimension	*Measure (type of question)*	*Code*
Is the response a question?	Adequate	A. $\overline{6}$
Structure : complexity	Complex	B. 1-5
Form of question : open/closed	Closed	C. 2-7
Attitude expression	Non-manipulative	D. 9
Suggestion of answer	No suggestion of answer	E. 4
Seeking opinion or information	Seeking information	F. 2
Content : referential	Seeking explanation	G. 21-24
Content : personal references	No personal reference	H. 1
Content : abstractness	General or abstract	I. 4-6

Briefly then, it is predicted that MC subjects will tend to ask more adequate questions, and of greater complexity. They will be more inclined to test hypotheses that they have formed regarding the topics, but will not be as ready to use questions for manipulative purposes. More of their questions are expected to be free from personal references, and these will be directed towards the obtaining of information rather than opinions. Their greater sophistication is expected to show itself in the tendency to seek explanation rather than simple description, and in the higher proportion of abstract references.

Fig. 6.1 Profile of Percentages of Questions on each Dimension for Two Social Class Groups, School A



	Social 1-5	Class 6-7	Reliability
A. Adequate	95	92	.999
B. Complex	68	60	.774
C. Closed	55	67	.884
D. Non-manipulative	75	80	.980
E. No suggestion of answer	42	50	.914
F. Seeking information	61	56	.862
G. Seeking Explanation	30	33	.887
H. No personal references	14	11	.826
I. General or abstract	65	52	.988

Key: Social classes: 1-5 x—x
6-7 o—o

That scoring was reliable is indicated by the high correlations shown in Figure 6.1 for the various dimensions.

Inspection of the two profiles indicates very little difference between the two social class groups; and when the mean difference was tested against its standard error, no evidence was found for a difference between profiles favouring either (t = 0.16). When the direction of differences for the individual dimensions was ignored, and the mean absolute difference was tested against the standard error, it was found to be significant at the five per cent level (t = 2.6). With this sample, therefore, it is clearly impossible to do more than refer to an overall pattern of results in very general terms. Results were in the predicted direction, *i.e.* favouring the MC subjects, for the measures given under dimensions A (adequate response), B (complex questions), F (seeking information [illegible] than opinion), H (questions free from personal references), and I (abstract and general questions); but in the opposite direction for the measures given under dimensions C (closed questions), D (non-manipulative questions), E (questions not suggesting the answer) and C (questions seeking explanation). With regard to dimensions where the MC subjects obtained higher percentages, differences under A, F and H are obviously negligible.

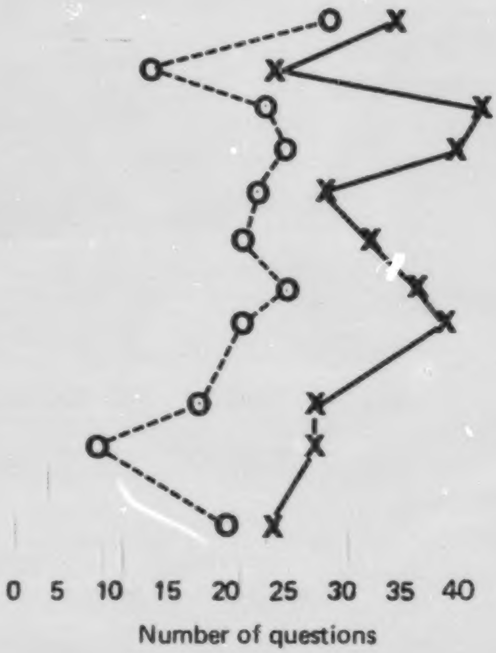
Analysis of variance was operated on the 'Complexity' and 'Abstractness' scores, using a weighting procedure which compensated for the fact that the WC subjects asked more questions. For both dimensions, the between-subjects factor was social class, and the within-subjects factor topic. In each case, this gave a two-way, repeated measures design.

Table 6.1 Analysis of Variance of Complexity Scores by Social Class by Topic

Source	Sum of Squares	df	Mean Square	F	P
Between subjects	*244*	*11*			
Social class	3	1	3	<1	
Error	241	10	24.1		
Within subjects	*630*	*120*			
Topic	100	10	0.0	2.08	<.05
Interaction:					
Social class by topic	50	10	5.0	1.04	
Error	480	100	4.8		

The finding of significant effects for topic for complexity calls for some comment. It is interesting to note that a very high proportion of subjects' questions on the topics 'Sport' and 'Doctors and Nurses' were complex questions (see Figure 6.2). It could be that subjects were more interested in these two topics and therefore tended to think about them at a higher level. At the other extreme, the proportion of complex questions asked on the topics 'Right and Wrong' and 'Politics' was very low, and might be held to indicate a lack of interest in these topics. As against this, however, it has to be noted that the topics 'Sport' and 'Doctors and Nurses' were usually first and last respectively in order of presentation, and although there is no strong evidence for association between order of presentation and either number of questions asked (Spearman's rho = .41, N = 11, not significant) or number of complex questions (Spearman's rho = .54, N = 11, not significant), the possibility that the effects of interest in topic and order of presentation of topic are confounded cannot be ruled out.

Fig. 6.2 Number of Complex and Total Questions Asked about Different Topics



Topics in usual order of presentation	Questions Total	Questions Complex
1. Sport	34	29
2. Right & Wrong	24	13
3. Education	41	23
4. Police	40	25
5. My future	29	22
6. Science	32	21
7. The future	36	25
8. Religion	39	21
9. Teenage problems	27	17
10. Politics	27	9
11. Doctors & nurses	24	20

Key: Total Questions x–x
Complex Questions o–o

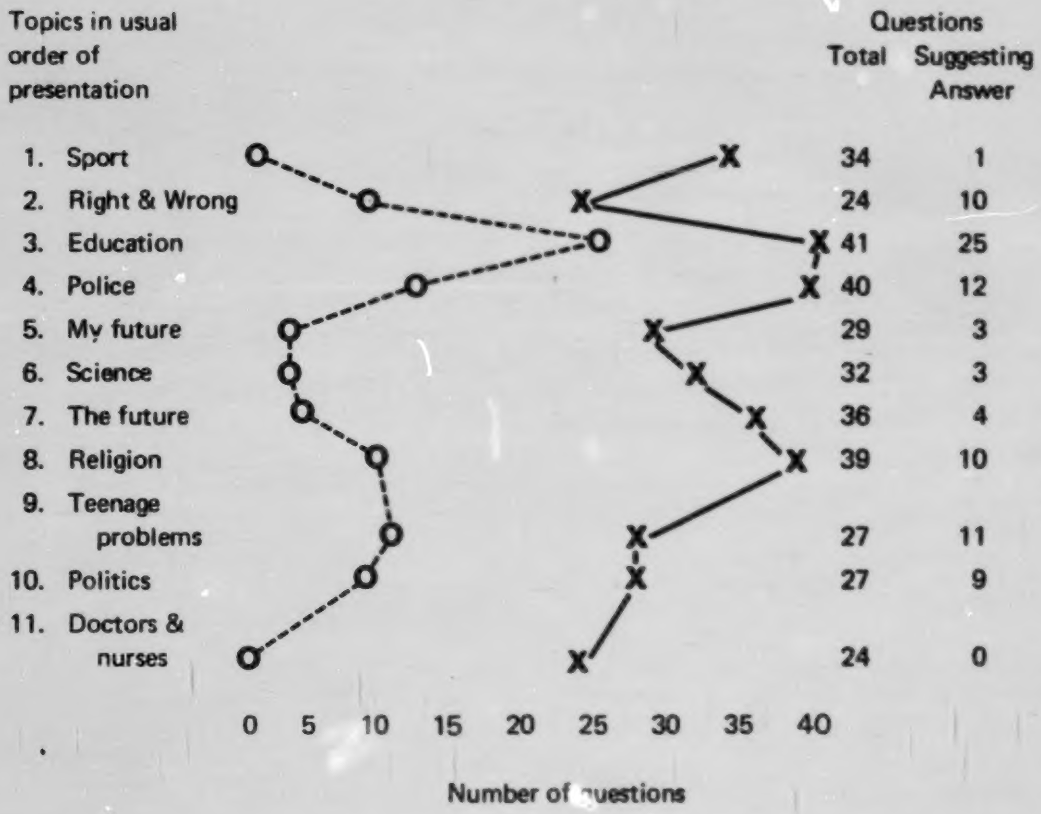
From the analysis of variance operated on Abstractness scores, it was clear that no significant effects could be attributed either to social class or topic, (Table 6.2).

With regard to the dimensions where the WC subjects obtained higher percentage scores than MC subjects, differences under D and G are obviously negligible. Analysis of variance was operated on the 'Closed' and 'Not suggesting an answer' scores, using the same weighting procedure as for 'Complexity' and 'Abstractness' scores. In the analysis of 'Closed questions' scores, the effects of social class and topic were not significant (Table 6.3).

Table 6.2 Analysis of Variance of Abstractness Scores by Social Class by Topic

Source	Sum of Squares	df	Mean	F	P
Between subjects	*206*	*11*			
Social class	5	1	5.0	<1	
Error	201	10	20.1		
Within subjects	*674*	*120*			
Topic	64	10	6.4	1.16	
Interaction: social class by topic	58	10	5.8	1.05	
Error	552	100	5.5		

Fig. 6.3 Number of Questions Asked about Different Topics: Total Number of Questions, and Questions Suggesting Answers



Topics in usual order of presentation	Questions Total	Questions Suggesting Answer
1. Sport	34	1
2. Right & Wrong	24	10
3. Education	41	25
4. Police	40	12
5. My future	29	3
6. Science	32	3
7. The future	36	4
8. Religion	39	10
9. Teenage problems	27	11
10. Politics	27	9
11. Doctors & nurses	24	0

Key:		
	All questions	x—x
	Questions suggesting answers	o—o

Table 6.3. Analysis of Variance of Closed Questions Scores by Social Class by Topic

Source	Sum of Squares	df	Mean Square	F
Between subjects	*363.8*	*11*		
Social class	13.3	1	13.3	<1
Error	350.5	10	35.05	
Within subjects	*917.3*	*120*		
Topic	77.3	10	7.73	1.00
Interaction: social class by topic	69.2	10	6.92	<1
Error	770.8	100	7.71	

In the analysis of 'Not suggesting an answer' scores, the effects of topic were just significant at the five per cent level, but the effects of social class were not (Table 6.4).

Table 6.4. Analysis of Variance of 'Not suggesting an answer' scores by Social Class by Topic

Source	Sum of Squares	df	Mean Square	F	P
Between Subjects	*319.32*	*11*			
Social class	6.70	1	6.70	<1	
Error	312.62	10	31.26		
Within subjects	*973.28*	*120*			
Topic	150.10	10	15.01	1.92	<.05
Interaction: social class by topic	43.80	10	4.38	<1	
Error	779.38	100	7.79		

With regard to the finding of significant effects for topic; from examination of the Figure 6.3 comparing total number of questions asked with number of questions suggesting an answer, it appears that on the two topics 'Sport' and 'Doctors and Nurses' the proportion of questions suggesting an answer is almost nil, whereas for the topic 'Education' a high proportion of such questions occur. It seems safe to say that children at school have already developed opinions regarding school, feel strongly about them, and are more ready to use questions for the purpose of expressing their own views.

As for the topics 'Sport' and 'Doctors and Nurses', what has already been said in dealing with complex questions would probably be applicable here also.

Under the tenth and final dimension J, number of words, no significant differences occurred. As the Table 6.5 indicates, the difference between mean number of words per subject slightly favours the WC group, but MC subjects used more words per response.

Table 6.5. Social Class and Number of Units in Responses

		Responses	
	$\bar{X}$ Responses	$\bar{X}$ Words per response	$\bar{X}$ Words per subject
Middle class (groups 1-5)	30.3	11.2	340.2
Working class (groups 6, 7)	32.8	10.7	350.5

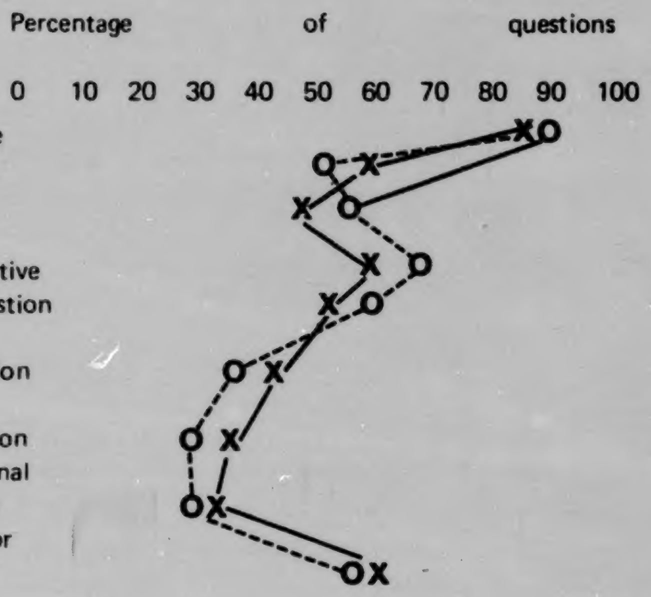
Summary and Discussion: School A. As far as the results for School A are concerned, although differences did not reach an acceptable level of significance, the coding frame appears to have been sufficiently sensitive to pick up certain meaningful divergences between the two social class groups. A tendency for MC subjects to ask questions of greater length, complexity and sophistication is discernable. Where results went in the opposite and unexpected direction, there appears to be room for doubt regarding the original interpretation. Subjects had a limited time in which to write questions, and it may be that MC subjects asked fewer questions because they tended to take more time over questions. It is to be noted that as the groups were matched for intelligence test scores, the MC subjects had no advantage when forming longer and more complex questions. The time factor could thus be held to operate in their case.

Furthermore, although MC subjects did not ask more closed, hypothesis-testing questions, it is possible that they chose answer suggestions as a strategy for hypothesis testing in preference to asking closed questions. In fact, their closed questions score itself could have been inflated if questions offering alternatives had been counted with closed questions as 'half-closed' questions. Data here are not sufficient for more detailed analysis within dimensions to make these finer comparisions possible. In any case, it would not be appropriate to press detailed findings to the point of claiming that they are of general application. Only twelve subjects were involved in what can only be regarded as a pilot study, and all were girls. The grouping of categories has undoubtedly obscured the operation of some factors and, as the form of the results stands, it is often possible to explain them irrespective of direction.

6.3.2. Results: School B

With this school aslo, it is possible to trace a profile for each of the two social class groups. In this case there are fifteen subjects, all boys, in each group; and within groups it was

Figure 6.4. Profile of Percentages of Questions on each Dimension for Two Social Groups
School B



Dimension	Social Class 1-4	Social Class 6-7	Reliability
A. Adequate	84	89	.994
B. Complex	58	50	.849
C. Closed	47	55	.871
D. Non-manipulative	59	67	.972
E. No suggestion	51	59	.852
F. Seeking information	41	36	.951
G. Seeking explanation	34	28	.757
H. No personal reference	32	29	.961
I. General or abstract	59	57	.815

Key: Middle Class 1-4 x — x
Working Class 6-7 o — o

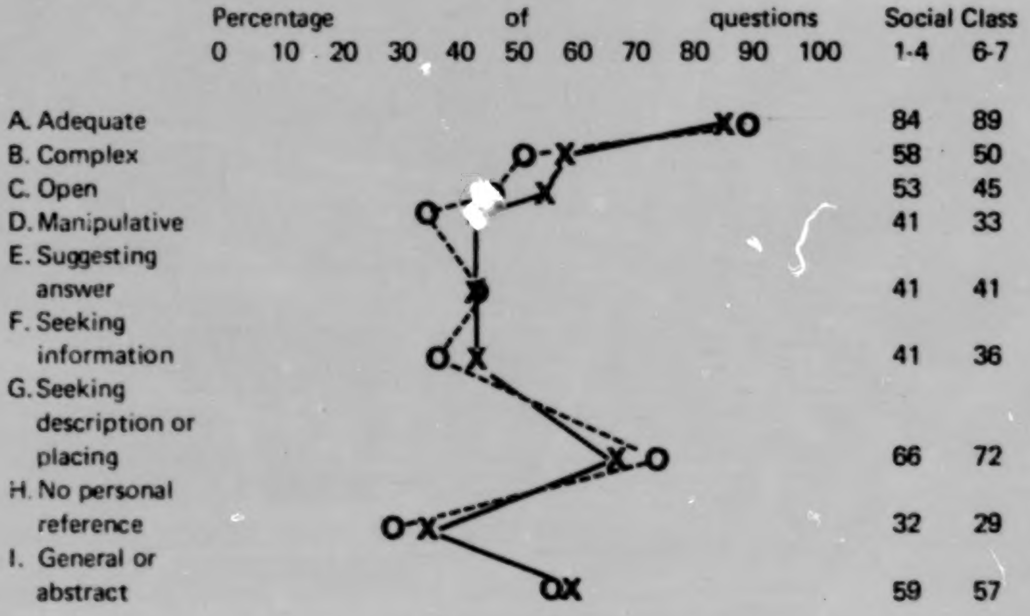
possible to assign subjects to three ability and attainment streams, High, Middle and Low respectively. The LWC subjects were again from groups 6 and 7 of the Hall-Jones scale, but the MC subjects were from groups 1-4. The profiles do not, therefore, correspond exactly to those of school A. If, however, the profiles are compared using the original predictions, as in the case of school A, the difference favouring social class group is not significant when tested against its standard error (t < 1) (Figs. 6.4 & 6.5).

When results for the two schools are considered together, they appear to tell a similar story. If, for example, we use the results obtained with school A to predict the direction in which the MC subjects will obtain higher percentages than the LWC subjects, the difference between profiles favouring the MC subjects and tested against its standard error is significant at the five per cent level (one-tailed test, t = 1.85).

This result might be better expressed in the following form:
for dimensions B (complex questions), F (seeking information rather than opinion), H (questions free from personal references) and I (abstract and general questions), results are in the predicted direction, *i.e.* favouring MC subjects, in both schools;
for dimensions C (closed questions), D (non-manipulative questions) and E (questions free from suggestion of answer), results go contrary to prediction, *i.e.* favouring the LWC subjects, in both schools.

Since a greater number of subjects took part in school B, it was possible to look at the results in more detail. For all dimensions except G, two-factor analysis of variance

Figure 6.5. Profile of Percentages of Questions on each Dimension for Two Social Class Groups, School B



	Social Class 1-4	Social Class 6-7
A. Adequate	84	89
B. Complex	58	50
C. Open	53	45
D. Manipulative	41	33
E. Suggesting answer	41	41
F. Seeking information	41	36
G. Seeking description or placing	66	72
H. No personal reference	32	29
I. General or abstract	59	57

Key: Middle Class 1-4 x—x
Working Class 6-7 o—o

was operated on question frequencies, with social class at two levels, and stream at three levels (High, Middle and Low). In the case of dimension G (Content: referential), in view of the large number of categories, it was possible to operate a three-factor analysis taking social class and stream as between subjects factors, and type of question asked as the within subjects factor offering repeated measures on subjects. For the purpose of these statistical comparisons, account was taken of the fact that WC subjects asked more questions. Weighting procedure involved multiplying MC subjects' scores by 6.3, and WC subjects' scores by 4.0. All data are summarised in Table 6.6.

A. *Is the response a question?* As with school A, more questions were asked by LWC subjects, the mean numbers of questions asked being 22.26 against 13.86. In the analysis of variance this effect was significant at the five per cent level (F = 4.80, df 1/24). The incidence of imcomplete and inappropriate responses was low in both groups, and no significant differences appeared on inspection of the data. No significant effects of ability (stream) level were found.

B. *Structure: complexity.* The direction of results for complex questions was the same as for school A, the MC subjects asking proportionately more complex questions. In the analysis of variance, however, the effects of neither social class nor of stream were significant.

Table 6.6. Rate of Use of Categories within Dimensions per Hundred Questions as a Function of Social Class

Dimension & Aspect		Social Class	
		MC	LWC
B. Complexity			
1.	Multiple question	1	1
2.	With subordinate clause	23	18
3.	With coordinate clause	2	2
4.	With statement	5	2
5.	With compound group	26	27
6.	Simple question	42	50
		99	100
Open/Closed			
1.	Open	53	44
2.	Closed common inversion personal	3	17
3.	Closed common inversion impersonal	6	7
4.	Closed particular inversion	34	30
5.	Closed?	4	0
6.	Closed 'wh' marker	0	2
7.	Closed other	0	1
		100	101

Dimension & Aspect			Social Class	
			MC	LWC
G. Referential Category				
Placing				
1 & 2	Agent all,		5	6
3	Action		9	7
4, 6, 8	Category all		0	2
5, 7, 9	Identity all		1	3
10, 11, 12	Space		0	1
13, 14, 16	Time		2	2
1-15	Total		17	21
Description				
15	Comparison		2	1
17	Degree		4	6
18	State		8	7
19	Process, method		2	1
20	Manner		34	33
16-20	Total		50	48
Explanation				
21	Function/purpose		18	21
22	Category/essence		2	1
23	Cause		13	6
24	Effect		1	0
25	Other		0	0
21-25	Total		34	28
		Total	101	97

Table 6.6 continued

Dimension and Aspect	Social Class		Dimension and Aspect	Social Class	
	MC	LWC		MC	LWC
D. Attitude Expression			H. Personal Reference		
Manipulative			Impersonal		
1. Expression/request	0	0	1. Personal	32	29
2. Friendly	2	3	2. I (appropriate)	7	5
3. Hostile test indirect	1	1	3. We	6	1
4. Hostile test direct	0	2	4, You	4	19
5. Hostile topic indirect	1	0	5. 3rd Pers.	17	9
6. Hostile topic direct	31	26	6. Self (not required)	5	1
7. Positive requrest	5	2	7. Own group	23	29
8. Negative request	0	0	8. Other group	51	46
Non-manipulative			9. Society	10	9
9. Uncertainty reduction	59	67	2-9. Sub-total	123*	119*
	99	101	Total	155	148

* There can be more than one personal reference per question

Table 6.6 continued

Dimension and Aspect	Social Class	
	MC	LWC
E. Answer Suggestion		
1. Suggesting	37	26
2. Possibly suggesting	6	11
3. Suggesting alternatives	5	3
4. Free of suggestion	51	39
	99	99
Opinion/Information Seeking		
1. Opinion	58	64
2. Information	42	36
	100	100

Dimension and Aspect	Social Class	
	MC	LWC
I. Abstractness		
1. Immediate	0	0
2. Restricted	12	13
3. Particular, direct	9	8
4. Particular, associated	20	22
5. General	20	22
6. Abstract	39	35
	100	100

C. Form of question: open/closed. Although the MC subjects asked a greater proportion of open questions than LWC subjects both in this school and in school A, the analysis of variance did not indicate significant effects for either social class or stream.

D. Attitude expression. Within this dimension, two of the nine categories accounted for more than ninety per cent of the questions asked. As in school A, the MC subjects asked a greater proportion of manipulative questions. This result, however, was only directional. The analysis of variance did not indicate significant effects for either social class or stream.

E. Suggestion of answer. Scores in the two categories 'suggesting answer' and 'possibly suggesting answer' were combined for the purpose of analysis. The direction of results was the same as for school A, the MC subjects asking a higher proportion of questions suggesting answer. The analysis of variance did not indicate significant effects for social class, but the effects of stream almost reached an acceptable level of significance ($F = 3.28$, df 2/24), with the High stream group scoring highest on this category, and the Middle stream lowest.

F. Seeking opinion or information. LWC subjects asked more opinion-seeking questions and the MC were correspondingly higher on information-seeking. This reverses the direction of results with school A, but the effects of both social class and stream failed to reach an acceptable level of significance.

G. Content: Referential Category. Under this dimension, the three main divisions suggested are, 1. Placing (categories 1-15), 2. Description (categories 16-20), and 3. Explanation (categories 21-25). In school A, the prediction that MC subjects would ask more explanation questions had not been supported. In school B however the direction of results went according to prediction. The three-factor analysis of variance gave no significant effects for the between subjects factors of social class and stream. Within subjects, however, a significant amount of variance was attributable to the factor of type of question asked (*i.e.* whether placing, description or explanation). Effects were significant at the five per cent level ($F = 4.94$, df 2/48). When means were compared and tested against the within-subjects mean-square error variance, it was found that subjects asked significantly more description questions ($t = 3.17$, df 48, $p < .01$). The only individual categories carrying enough questions to permit meaningful comparison were G.20. Description, manner and G.21, Explanation purpose. No significant differences were found between classes or streams.

H. Content: personal references. No significant differences between social classes had been found with school A. The direction of results favoured MC subjects for proportion of personal references, and proportion of questions framed without personal references, and proportion of questions using personal references not strictly required by the test situation itself. In school B, although MC subjects again made proportionately more personal references, the differences were not significant. Analysis of variance indicated no significant effects of social class or stream (F values all < 1). There was, furthermore, no difference between classes when proportion of questions using personal references not strictly required by the test situation (H. 6-9) were compared using the Mann-Whitney test. The direction of results again favoured MC subjects for proportion of questions framed without personal references, but differences were not significant.

Other comparisons made include analysis of variance of 'I-you' (H. 2, 4, 6) scores, 'We-they' (H. 3, 5, 7, 8) scores and the ratio of 'I-you' to 'We-they' scores. MC subjects were expected to use more 'I-you' scores, while peer group allegiance would be reflected in higher 'We-they' scores in the case of WC subjects. Results went in the contrary direction, but no significant class or stream effects were found.

I. Content: abstractness. More abstract questions had been expected from MC subjects, but as in the case of school A, although differences were in the predicted direction, they did not reach an acceptable level of significance. Analysis of variance of frequency of questions in the category Abstract (I. 6) indicated that although the effects of social class were not significant, the effects of stream were. ($F = 4.22$, df 2/24, $p < .05$). Comparison of means shows that High stream subjects asked significantly more abstract questions than Low stream subjects ($t = 3.21$, df 24, $p < .01$) and the Middle and Low stream subjects taken as a group ($t = 2.88$, df 24, $p < .01$).

Directional agreements

The Bernstein hypothesis suggests that social class can offer the same kind of advantage as intellectual ability. From this, it might be expected that scores of the MC subjects in relation to those for the WC group will be directionally the same as those for HIgher stream subjects in relation to Lower stream subjects. If the results for school B are considered dichotomous categories under most of the dimensions such that under one category or group of categories MC subjects will obtain proportionately higher scores whereas under the other category, the position will be reversed. The relationship between HIgh and Low streams for those categories can then be examined (see TAble 6.7). It is immediately apparent that the High stream subjects tend to have a higher mean score than Low stream subjects under most categories simply because they asked more questions. For this reason, the exceptions are of particular interest. For the only two categories where Low stream subjects asked more questions than High stream subjects, the proportion of questions asked was higher for LWC (groups 6, 7) than for MC (groups 1-4) subjects. The categories concerned are 'Placing' questions and 'Particular' as against 'General or abstract' questions. Furthermore, if allowance is made for the fact that High stream subjects asked more questions overall than Low stream subjects in the ratio 3:2, the situation may be more appropriately represented in Table 6.8.

Applying Fisher's exact probability test to the data, this pattern of results is statistically significant at the one per cent level. Another finding which has implications for interpretation of the study as a whole relates to the tenth and final dimension J, number of words. As in the case of school A, the difference between mean number of words per subject favoured the WC group, while MC subjects used more words per response. Although the difference in words per response was significant at the 0.1 per cent level, there was a large disparity between variances for the two social class groups ($F = 5.66$). With middle-class subjects the variance was significantly greater ($p < .001$) (Table 6.9). Thus it appears that in spite of the matching procedure, the two samples are not homogeneous.

Table 6.7. Mean Number of Questions Compared for High and Low Stream Subjects

Dimension & Category		Stream High	Stream Low	High: Low Ratio below 3:2	Social Class Group with proportionately higher no. of questions
A.	Question or equivalent	23.0	16.8	*	LWC
B.	Complex questions	12.3	5.8		MC
	Simple questions	9.3	8.7	*	LWC
C.	Open questions	8.3	8.1	*	MC
	Closed questions	10.8	8.4	*	LWC
D.	Manipulative questions	9.7	5.6		MC
	Questions to reduce uncertainty	12.3	11.8	*	LWC
E.	Suggesting answer	11.2	6.6		MC
	No answer suggestion	10.6	9.7	*	LWC
F.	Seeking opinion	13.7	9.9	*	LWC
	Seeking information	8.4	6.4	*	MC
G.	Placing	3.8	4.2	*	LWC
	Description	10.6	7.1	*	MC
	Explanation	7.5	5.2	*	MC
H.	Impersonal	7.9	3.9		MC
	No. of personal references	25.4	18.2		MC
I.	Particular	7.6	8.8	*	LWC
	General or abstract	14.3	3.9		MC

* indicated where the ratio is less than 3:2

Table 6.8. Concordance of Stream and Social Class Differences in Category Usage

	Ratio of High Stream Scores to Low Stream Scores Greater than 3:2	Less than or equal to 3:2
Middle-class asks proportionately more questions	6	4
Working-class asks proportionately more questions	0	8

Table 6.9. Social Class and Number of Units in Responses

	$\bar{X}$ Responses	$\bar{X}$ Words per response	$\bar{X}$ Words per subject
Middle Class (1-4)	16.6	12.02 (sd = 5.42)	199.6
Lower Working Class (6, 7)	26.7	9.26 (sd = 2.28)	247.0

Summary and discussion: School B. There is evidence to suggest that the coding frame or taxonomy of questions has picked up certain differences of emphasis between the two groups of subjects selected for comparison on the basis of social class. When results are considered under the separate dimensions, statistically significant differences rarely occur, but meaningful patterns are apparent, and where differences reach an acceptable level of significance statistically, they do so at points of considerable interest.

The finding that LWC subjects asked more questions and wrote more words goes contrary to expectation and calls for some explanation. A possibility is suggested by the finding of a disparity between variances when the number of words per response for the two groups is considered. It is possible that the effects of social class have already been decided at an earlier age. They would thus be confounded with the effects of intelligence and attainment by the time subjects have reached adolescence. Social class may have contributed towards a basic or genetically determined intellectual capacity, subsequent development of intelligence through adequate stimulation and encouragement; and the attainment that these would facilitate. This would tend to make MC subjects 'over-achievers' at the adolescent age; or at least a higher proportion of over-achievers might be expected to occur in a sample of MC subjects at this stage; a fact that would be obscured by the matching procedure. This would contribute to a greater variability in question frequency scores. The MC sample would be less homogeneous. If this is the case, our sample will have included over-achieving MC subjects and under-achieving WC subjects at the two extremes. This would remove advantages that the MC subjects might be expected to possess.

The dimension of abstractness was expected to indicate differences between groups at the cognitive level. Results showing statistically significant stream differences in the predicted direction *i.e.* favouring high stream subjects, suggest that as far as this dimension is concerned, the coding frame has possibilities. Controlling for the variable relating to under- and over-achievement could have the effect of sharpening the distinction between groups on this and other dimensions where results confirm the prediction of higher socres for the MC subjects.

As far as the overall pattern of results is concerned, it has already been pointed out that in both schools, the MC subjects tended to ask a greater proportion of complex questions, information-seeking questions, questions free from personal references, and abstract or general questions. Contrary to prediction, the LWC subjects asked more closed, hypothesis-testing questions, non-manipulative questions, and questions free from suggestions regarding the answer. Taking this together with the finding that the MC subjects used a greater number of words per response, it seems reasonable to conclude that their questions tended to be more complex in structure and more sophisticated in content and intention, and that this sophistication demanded a greater number of words and possibly more time for each question.

This study was designed to test the ability of the coding frame to pick up social class differences over a wide range of categories. Sample sizes and techniques clearly need to be modified and varied if significant differences on specific categories are to be found. For this reason, it has not been possible to establish exactly what goes on within the different groups of subjects; but the coding frame appears to have been sufficiently sensitive to indicate a tendency for high stream and MC subjects to respond similarly in the question-framing situation, a tendency which was statistically significant if weighting procedures are deemed acceptable.

6.4. Simplification of the Question Taxonomy

One way of modifying techniques of investigating differences in question-asking behaviour is to use a simplified coding frame or taxonomy of questions. Under certain conditions, a much less time-consuming scoring procedure might also be welcomed, although information would have to be sacrificed. An attempt was, therefore, made to design a useful shorter taxonomy, while at the same time minimising the amount of information lost in the process, by using techniques whereby possibly relevant factors might be isolated and identified.

6.4.1. Factor Analytical Procedure

A preliminary principal components analysis was carried out on the seventy two scoring categories and this was followed by a factor analysis on grouped categories. In order to facilitate meaningful comparisons, categories were grouped within each dimension to form twenty one grouped categories in all. Where possible, categories were grouped in such a way as to suggest dichotomous variables, *e.g.* under dimension B (syntactic structures of questions: complexity) the categories 1 'multiple question', 2 'question with subordinate clause', 3 'question with co-ordinate clause', 4 'question with statement', and 5 'question with compound group', were all placed under the single rubric, 'complex', in opposition to the remaining category 'simple'. The criteria for division were largely intuitive, but were also based upon inspection of responses in the study on school A, and already incorporated into the taxonomy. They received support from the preliminary principal components analysis.

The analyses were carried out with a computer programme XDS2 produced by International Computers Limited, ICL, 1900 series, Statistical Analysis Mark 2 (9). The factor analysis was carried out on a correlation matrix, the dimensions of the test space being derived from a principal components analysis in which ninety per cent of the variance was accounted for by five dimensions or components. Five factors accounted for approximately ninety per cent of the variance. Factors were not rotated to a final solution in view of the fact that responses from only a small sample of subjects had been scored. Furthermore, it was only intended to use the analysis in order to discover whether the intuitive allocation of responses to categories and groups of categories was meaningful, and in order to prepare the way for a simplified taxonomy.

Factor analysis results. In the preliminary principal components analysis six components accounted for sixty per cent of the variance.

These were:

1. A general component, accounting for over twenty five per cent of the variance, and relating to the total number of responses made under each category.
2. A component whose bipolarity appears to relate to the 'seeking information – seeking opinion' and the 'open-closed' dichotomies. Over ten per cent of the variance is accounted for by this component.
3. A manipulative component, accounting for over eight per cent of the variance.
4. A component accounting for over six per cent of the variance, but which it is difficult to label. It appears that subjects whose scores tend to be positively loaded on this component choose to seek specification of places, times and persons, rather than activities.
5. A number of personal reference variables have loadings on this component, which accounts for over five per cent of the variance. The personal reference loadings are in both directions, and what appears to matter is whether or not the personal references are situationally appropriate.
6. A component which appears to relate to inadequacy of response. About five per cent of the variance is accounted for by this component.

7-15. Nine components accounted for a further thirty per cent of the variance, but as the responses of only thirty subjects on nine topics had been scored over the seventy two categories, it is difficult if not impossible to assign meaningful labels.

The grouped categories on which factor analysis was operated were as follows:

Response (RESP) A.476, 9-12, N	
Complex (COMP) B.1-5	Simple (SIMP) B.6
Open C.1	Closed (CLOS) C.2-7
Manipulative (MANI) D.2-7	Reduce uncertainty (REDU) D.9
Suggesting answer (SUGG) E.1-3	Free from suggestions (FREE) E.4
Seeking opinion (OPIN) F.1	Seeking information (INFO) F.2
Placing (PLAC) G.1-9, 12, 14, 15	
Description (DESC) G.16-20	
Explanation (EXPL) G.22-24	
Impersonal (IMPE) H.1	Personal (PERS) H.N
'I-you (IYOU) H.2, 4, 6	
'We-they' (WETH) H.3, 5, 7-9	
Particular (PART) I.1-4	General (GENL) I.5, 6
Number of words (WDNO) JN	

Note: Where variables are dichotomous, they are put side by side, Variable names, as input to the computer programme, are given in parentheses to facilitate reading tables in the appendix.

Four of the five factors proved to be dichotomous or bipolar, and it appeared possible to assign meaningful labels to all five factors as follows (see Table 6.10 for details):

1. Response
2. Testing
3. Complexity
4. Manipulation
5. Personal references

Table 6.10 Factor Loadings of Grouped Categories of Dimensions of Questions (30 subjects over 9 topics)

	Factor Loadings				
Variables (Grouped Categories)	1	2	3	4	5
Response made	97	05	04	04	01
Complex questions	81	02	-57	-01	-01
Simple questions	84	10	52	01	-01
Open questions	73	-68	03	-01	00
Closed questions	65	77	-05	00	00
Manipulative questions	66	-18	-31	65	-07
Questions seeking to reduce uncertainty	83	20	21	-47	01
Questions suggesting the answer	75	02	-26	49	-04
Free from suggestions regarding answer	84	07	21	-41	00
Seeking opinion	75	49	-05	22	01
Seeking information	74	-46	05	-26	-05
Seeking information on placing	69	-14	32	-28	23
Seeking description	75	57	-16	-14	-06
Seeking explanation	58	-57	02	36	-10
Questions free from personal references	83	-18	-21	-03	-39
Number of personal references	80	22	-15	08	50
Personal references, 'I-you'	32	59	01	-10	41
Personal references, 'We-they'	82	-04	-20	15	41
Particular	77	16	30	-26	13
General or abstract	91	00	-23	06	-09
Number of Words	60	05	-38	19	34
Percentage variance (89)	57.3	13.0	6.6	7.3	4.5

F1 identified as Number of Responses
F2 identified as Testing
F3 identified as Complexity
F4 identified as Manipulation
F5 identified as Personal References

1. Response. This is clearly a general factor, accounting for over fifty seven per cent of the variance, and relates to the total number of responses made under each grouped category. The variable 'response' has a positive leading of 0.97 on this factor.

2. Testing. This factor accounts for thirteen per cent of the variance. The evidence for bipolarity is strong, and this primarily relates to the 'closed-open' dichotomy, the loadings being + 0.77 and - 0.68 respectively, that is to say both loadings are high and they are in opposite directions. Closed questions may be regarded as serving the purpose of testing hypotheses which are being advanced by the questioners, and in such cases it might be expected that subjects will be interested in obtaining opinions. Such opinions would serve as feedback on the testing procedure. Consistent with this view is the finding of high positive loadings on the factor of the following variables:

'I-you'	(+ .59)
'Personal'	(+ .22)
'Seeking opinion'	(+ .49)

The testing associated with this factor would thus appear to involve more than just hypothesis-testing. It is as though those who are being questioned are also being tested for their reactions, and not simply for their usefulness as sources of information. The loading of 'seeking information' on the factor is negative (- .46) but this does not mean that questions are being used for manipulative purposes. In fact, 'manipulative' has a slight negative loading (- .16) whereas the dichotomous variable 'reduce uncertainty' has a positive loading (+ .20).

The meaning of the high loadings of the two variables 'description' (+ .57) and 'explanation' (+ .57) on the factor is not clear. Subjects testing for and seeking opinions might also be expected to show a greater interest in explanations than descriptions, but the reverse position appears to hold here. It may be a matter of using the form which is more suitable for the questioner's purpose. Whereas open questions may be appropriate when seeking explanations, closed questions are more likely to be used when seeking descriptions. It may be urged that requests for explanation usually begin with interrogative words like 'why' and 'how'. These are inevitably open questions. Furthermore, when subjects ask questions seeking explanation, it is more usual to suppose that they do not know what the answer is, and that they probably do not have an hypothesis to test. When seeking description, however, subjects are as likely to use the closed question say, 'Is it red?' as the open question 'What colour is it?'. Furthermore, open questions of the form 'What causes its redness?' are almost certainly less frequent than questions of the form 'Is it red?'.

3. Complexity. This factor accounts for over six per cent of the variance. The evidence for bipolarity is strong, and this primarily relates to the 'complexity-simplicity' dichotomy. The loadings are - .57 and + .52 respectively, that is to say there is a high negative loading of complexity and a high positive loading of simplicity on the factor. Congruent with this is the finding that the 'particular-general' dichotomy is also relevant. The loading of 'particular' on the factor is positive (+ .30) and this strengthens the association of this variable with 'simplicity'. The negative loading of 'general (- .23) on the factor offers an association that may be expected with 'complexity'. It makes sense to suppose that subjects whose questions are complex will be more likely to ask general and abstract questions. There is a positive loading of 'placing' (+ .32) on the factor, and this would appear to associate requests for information identifying persons, things, times and places with 'simplicity'. Does this mean that this kind of question, *i.e.* the 'placing' question, is more direct, to the point, and therefore simpler? A difficulty arises at this point. It does not follow that because subjects ask simple questions, they do so because they are unable to ask complex questions. It is true, of course, that complex questions will offer cognitive problems to the less able. Syntactical complexity in particular might be expected to be within the reach of the more able. But subjects may choose to write simple questions in spite of the fact that they are able to write complex questions. It may be a matter of style; or even possibly a sign of ability to think clearly and to give clear expression to one's thoughts.

The variables 'manipulation (- .31) and 'suggesting answer' (- .26) both have negative loadings on the factor. This is consistent with a suggestion that the use of questions for manipulative purposes introduces a complication into the questioning situation. Loadings of the dichotomous variables on this factor were positive, associating 'reduce uncertainty' (+ .21) and 'free from suggestions' (+ .21) with 'simplicity'. It is possible that subjects who are capable of formulating complex questions will also be more adept in the use of questions for manipulative purposes, although it does not follow that they will necessarily be more inclined to do so. The negative loading of 'impersonal' (- .21) on the factor may be interpreted as indicating that persons who are capable of writing complex questions are also able to frame questions without reference to persons. This does not mean that they will necessarily make fewer personal references, as the associated negative loading of 'we-they' (- .20) on the factor testifies. The suggestion here is that impersonal questions are possibly more difficult to frame. The negative loading of 'number of words' (- .38) on the factor is consistent with a view that more complex questions tend to require more words.

4. Manipulation. This factor accounts for over seven per cent of the variance. The evidence for bipolarity is strong, and primarily relates to the 'manipulation-reduce uncertainty' dichotomy, the loadings being positive for 'manipulation' (+ .65) and negative for 'reduce uncertainty' (- .47). We might expect that there will be an association between 'manipulation' and 'suggesting answers' and in fact the 'suggesting answers — free from suggestions' dichotomy, with loadings of + .49 and - .41 respectively, is in evidence. It appears, therefore, that subjects who use questions in order to express an attitude or make a request, tend also to suggest how their questions should be answered. Furthermore, they tend to seek an opinion rather than information; the loadings of these two variables 'seeks opinion' and 'seeks information' on the factor being + .22 and - .26 respectively. Consistent with this, they tend to avoid particular and direct references, preferring explanation to identification or specification of persons and objects. The relevant loadings are 'particular' (- .26), 'placing' (- .28), and 'explanation' (+ .36).

5. Personal references. This factor accounts for over four per cent of the variance. The evidence for bipolarity is again strong, and primarily relates to the dichotomy 'personal' (+ .50) — impersonal (- .39)'. Consistent with these loadings are the positive loadings of 'we-they' (+ .41) and 'I-you' (+ .41) on the factor. In this connection, it is interesting to note that these two latter variables are in opposite direction of polarity when considered in relation to Factor 4 *viz.* 'manipulation'. ('we-they' + .15, 'I-you' - .26) We may wonder how, and in what way, 'we-they' could be supposed to be more manipulative than 'I-you', but we need not doubt that both variables have a personal reference. There is no obvious explanation for the positive loading of 'number of words' (+ .34) on the factor, although it is arguable that subjects who make more personal references are engaging in a task that is superfluous to the requirements of a strictly information-seeking situation, and that they will therefore tend to use a greater number of words.

With regard to the loading of 'placing' (+ .23) on this factor, associating the variable with 'personal', it may be that subjects who make personal references tend also to ask questions regarding identity of persons and things; but there does not appear to be any strong reason why this should be so.

6.4.2

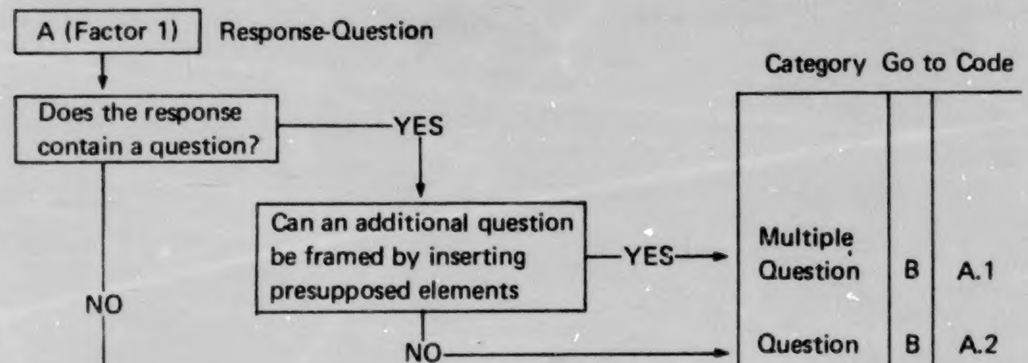
In the light of the findings mentioned, it would seem to be reasonable to collapse coding decisions in accordance with the following chart:

TAXONOMY OF QUESTIONS

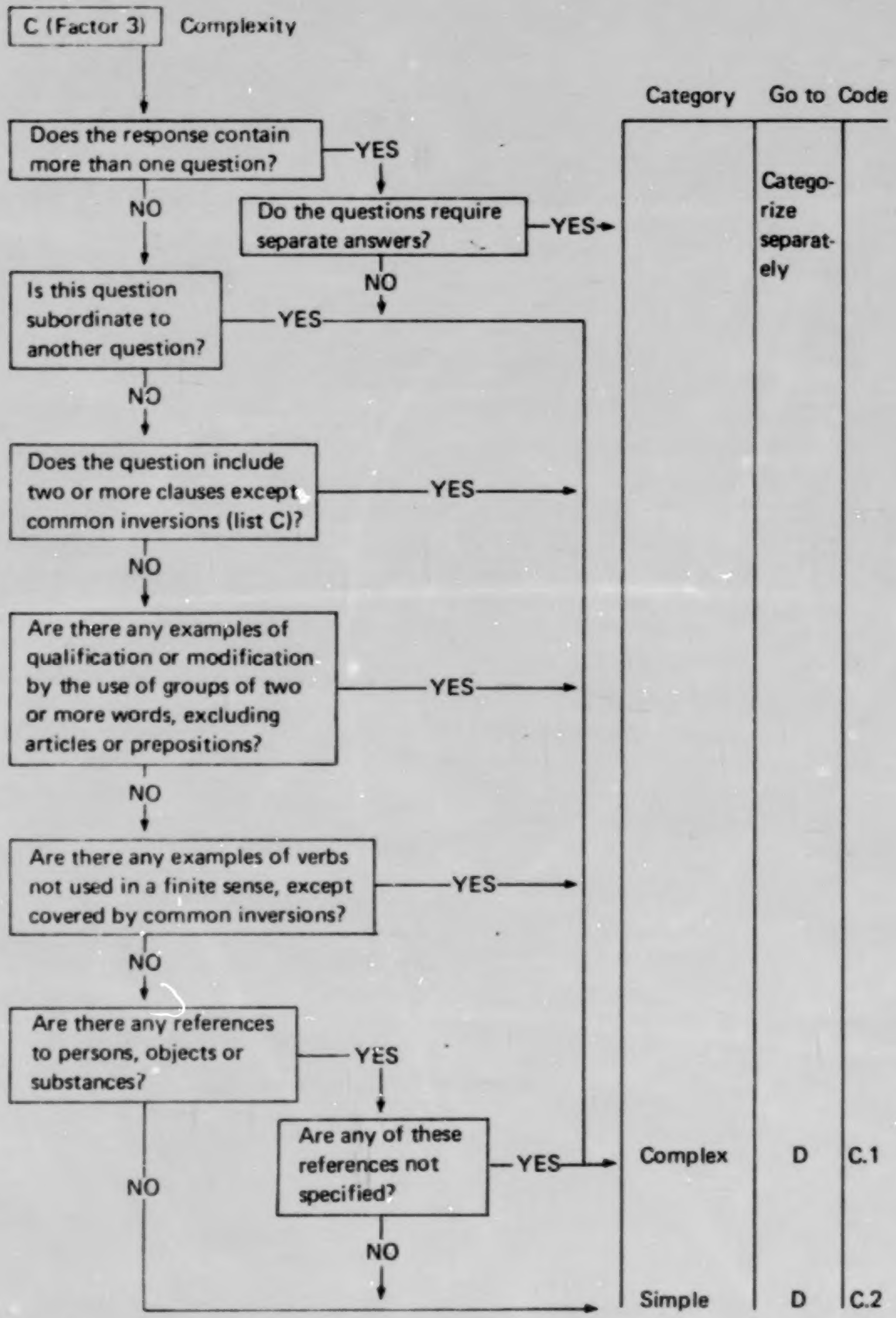
Simplified Flow Chart

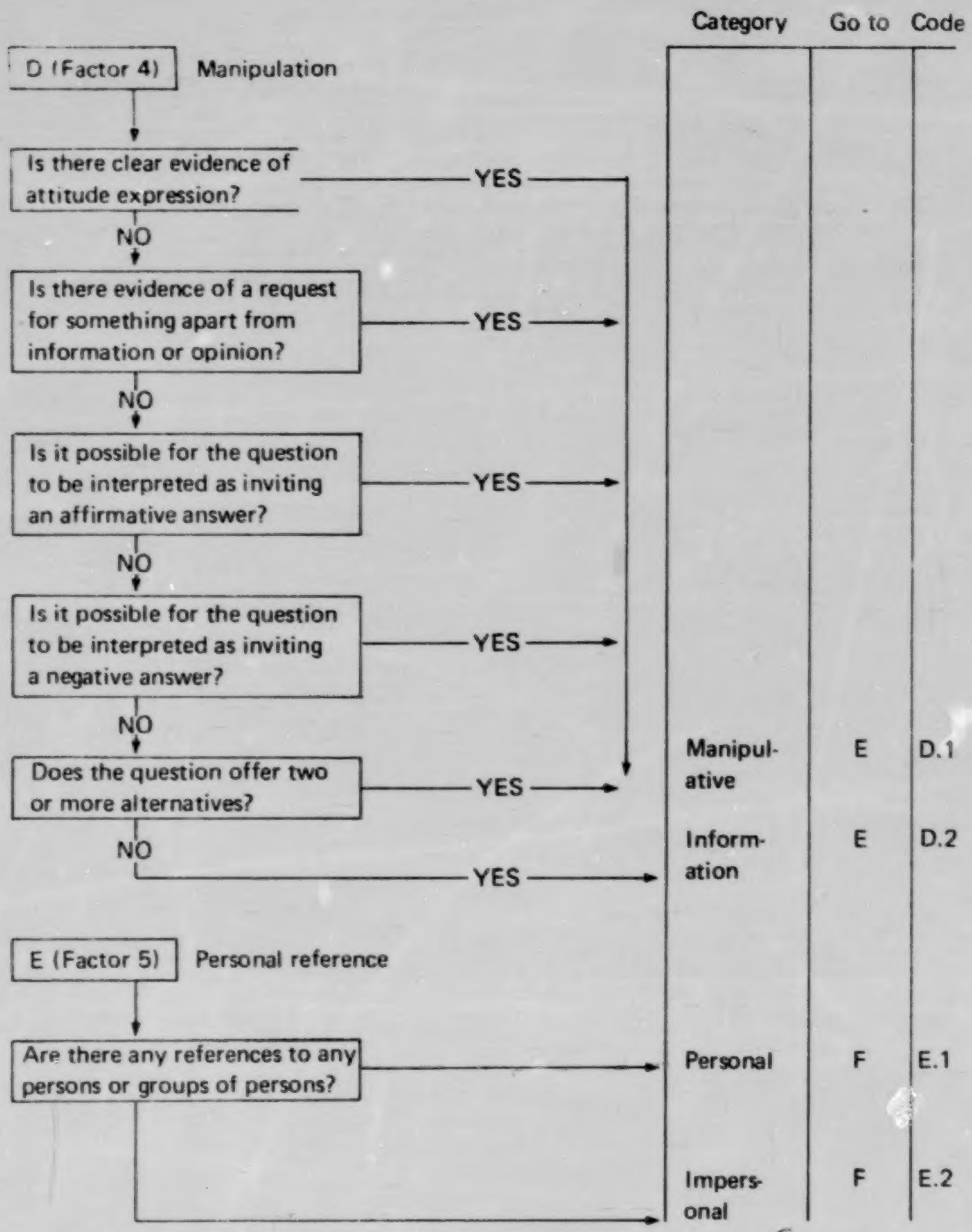
....

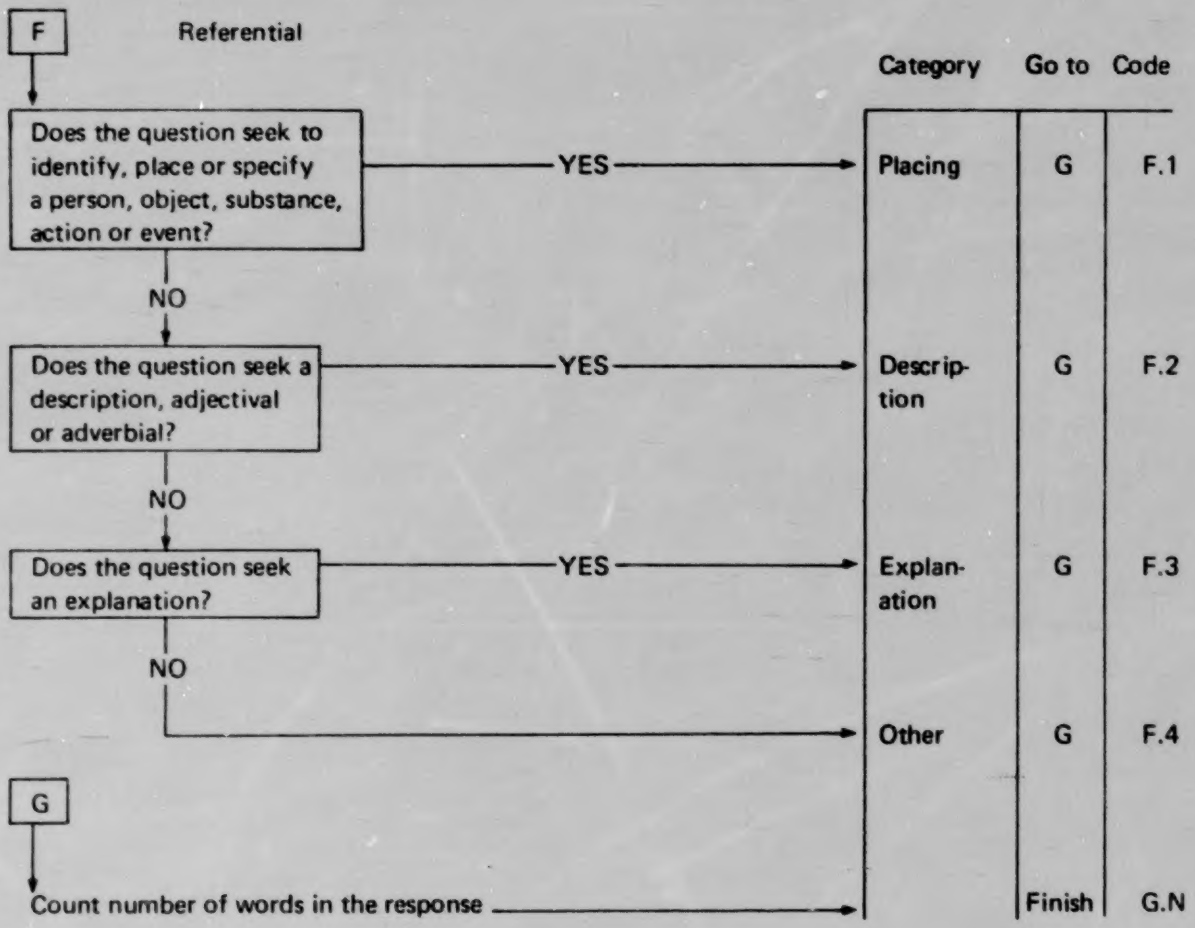
START HERE:



A (Factor 1)
Response-Question
Category
Go to
Code
Does the response contain a question?
YES
Can an additional question be framed by inserting presupposed elements
YES
Multiple Question
B
A.1
NO
NO
Question
B
A.2
Inadequate response
G
A.3
B (Factor 2)
Testing
Is the question closed?
YES
Testing
C
B.1
NO
Does the question seek an opinion, value judgement or subjective assessment?
YES
NO
Open
C
B.2


C (Factor 3)
Complexity
Category
Go to
Code
Does the response contain more than one question?
YES
Do the questions require separate answers?
YES
Catego-rize separat-ely
NO
NO
Is this question subordinate to another question?
YES
NO
Does the question include two or more clauses except common inversions (list C)?
YES
NO
Are there any examples of qualification or modification by the use of groups of two or more words, excluding articles or prepositions?
YES
NO
Are there any examples of verbs not used in a finite sense, except covered by common inversions?
YES
NO
Are there any references to persons, objects or substances?
YES
Are any of these references not specified?
YES
Complex
D
C.1
NO
NO
Simple
D
C.2


Category
Go to
Code
D (Factor 4)
Manipulation
Is there clear evidence of attitude expression?
YES
NO
Is there evidence of a request for something apart from information or opinion?
YES
NO
Is it possible for the question to be interpreted as inviting an affirmative answer?
YES
NO
Is it possible for the question to be interpreted as inviting a negative answer?
YES
NO
Does the question offer two or more alternatives?
YES
NO
YES
Manipulative
E
D.1
Information
E
D.2
E (Factor 5)
Personal reference
Are there any references to any persons or groups of persons?
Personal
F
E.1
Impersonal
F
E.2


F
Referential
Category
Go to
Code
Does the question seek to identify, place or specify a person, object, substance, action or event?
YES
Placing
G
F.1
NO
Does the question seek a description, adjectival or adverbial?
YES
Description
G
F.2
NO
Does the question seek an explanation?
YES
Explanation
G
F.3
NO
Other
G
F.4
G
Count number of words in the response
Finish
G.N

6.5. Summary and General Discussion

According to the Bernstein hypothesis, children of MC families should have the advantage of more experience in asking, and receiving answers to, questions. Together with pupils of high measured verbal IQ, they should find it easier to communicate with the teacher by means of questions, and their questions should be of a higher quality. In spite of this, they may find it more convenient to accept the norms of the majority of their school class.

A number of studies (see chapter 2) have shown that questions may also be a function of such factors as age, sex, and mental activity. As subjects grow older, their questions may increase in frequency at first, but a decline in frequency can follow while the quality of questions improves. Boys apparently tend to ask more questions than girls, except at the age of two years when the greater frequency of girls' questions may be attributed to their earlier language development. With regard to mental activity, some evidence exists for a curvilinear relationship between number of questions asked and favourable scores on measures of pedagogical interest.

Questions have, not unnaturally, been used as a measure of curiosity, and it is on the assumption that in the case of MC children, curiosity behaviours have been encouraged, that a higher frequency of questions is expected from them.

The question-framing behaviour of adolescent pupils was investigated using a taxonomy of questions designed to indicate dimensions and categories where social class differences might be observable. Two schools were visited, and written questions were elicited from pupils on a number of topics. The responses of twelve girls from school A were analysed, and served as a basis upon which the taxonomy was developed. The responses of thirty boys from school B were then analysed. Although individual differences between the social class groups in school A did not reach an acceptable level of significance statistically, a tendency for the MC subjects to ask questions of greater length, complexity and sophistication was discernible. They wrote fewer questions, but as their questions were longer, and the amount of time allowed was the same for all subjects, this is understandable. A similar pattern of results emerged for school B, and when profiles for the two social class groups were compared, taking the direction results of school A as a basis for prediction, the data indicated differences in the predicted direction which were statistically significant.

With respect to intelligence, the two social class groups do not appear to have been homogeneous. Matching for this variable with adolescent pupils may obscure certain patterns of interaction between heredity, ability and achievement motivation. It is in spite of this difficulty that the taxonomy has been successful in picking up certain meaningful divergencies between the two social class groups.

For some purposes, an abbreviated taxonomy might be more practicable, but given a larger sample of subjects, it may be claimed for the full taxonomy that it offers enough categories to make finer comparisons at points of theoretical interest where the broader generalisations have a tendency to break down.

The interaction of motivational and cognitive factors is, of course, a matter of considerable concern for all who have an interest in educational programmes. This means that when attempting to generalise from results obtained by visitors to schools which have their own history of pedagogical practice and problems, we must bear in mind the possibility of a variety of approaches by pupils towards an experimental situation in which attempts to tap these differences in attitude towards the procedure of question asking in a number of possible circumstances, and it may be that it would find its greatest usefulness at specific points occurring before and after intervention programmes designed to encourage and improve the quality of question asking.

Editorial Comment. As Prosser's careful analysis shows, the 'profiles' of the proportions of the various attributes of the questions asked by MC and WC pupils are such that the support for the theoretical expectations is general but not universal and weak rather than strong. His observation that this may arise because the MC pupils could have been 'overachievers' and the WC ones 'underachievers' encourages, or even requires, a digression into the methodological hazards of making and interpreting social class comparisons. This digression is necessary because its substance justifies the switch of emphasis away from the social class differences as exemplified in chapters 5, 6 and 7 to the study of the operation of curiosity and questioning within the working class (chapters 3, 4, 7, 8 and 9).

Social class comparisons of small samples of pupils of matched attainment (or ability) within a single school fail to provide valid estimates of the significance of social class as a determinant of differences in so far as the samples are typical of the populations to which generalisation is intended and in so far as the measures of attainment and ability are not functioning as independent variables. Unfortunately a mass of evidence can be adduced to show that both propositions can be true.

We have no brief to set out the full arguments about the relationships between IQ scores, the concept of 'intelligence', and the assumptions and logical coherence of the arguments that assign proportions of variance to genetic and environmental influences to IQ scores. Suffice it to say that both Jensen (1968) and Eysenck (1971) have underestimated the extent to which IQ scores can be shifted by induced experiences. Skeels' (1966) demonstration of a fifty five IQ point difference in 'experimental' and 'control' groups of fostered and orphanage children and Heber and Garner's (1970) thirty three point differences in trained and untrained children are the two strongest examples of IQ scores being affected by interference with normal experience for 'disadvantaged' children, while many significant but less dramatic shifts could also be cited (Bereiter, 1972; Creed & Robinson, 1971; Gray and Klaus, 1965; Weikart, 1972). Such studies concentrate their attention upon children at the bottom end of the status hierarchies of society and that these children are underachievers in the educational system has also been repeatedly demonstrated (Douglas, 1967; Douglas, Ross & Simpson, 1971: Husen, 1972). Attainment even more than IQ scores are depressed in WC children and this depression can be argued to increase with age and original potential (Douglas, 1967; Gordon, 1923).

Hence to match MC and WC teenagers on IQ scores is an odd procedure, since it is likely that the WC IQ scores are underestimates of the potential and overestimates of the attainment measure (stream) which we need. And we have no way out of this difficulty. If the factors associated with being working class have been acting for fourteen years to preclude sensible matching with MC peers, comparisons based on such matching can demonstrate only the residual effects of class.

This argument is confounded however by our ignorance of what happens to 'deviant' groups. What do MC parents do if their children are below average on developmental norms that parents accept as desirable? Do they step up 'home education' to bring their children up to average, and are they successful in such enterprises? If they fail are they more likely to pull their children out of the state sector of education? The point of raising these questions is to suggest and we can do no more, that the MC boys in our study may also have been somewhat atypical, especially those in the lower streams. Whether or not any abnormality results in the parental behaviour becoming ultra middle class or more laissez faire we cannot say.

For our particular subjects we should need to know their individual family histories, but more generally we decided that it was not informative to make social class comparisons at secondary age levels. If, in such studies, we relaxed controls for indices of ability or attainment, our work would be condemned as futile. If we maintained the controls we would be eliminating much of the variance attributable to social class. Until the climate of academic opinion shifts, and there is some consensus about definitions of 'intelligence' supported by an adequate theory linked to measures, and until those of us who share an interactional viewpoint are able to persuade both rabid environmentalists and staunch hereditarians of their inconsistencies, we had better direct our efforts to demonstrations of the kinds of experience that can lead to learning that can be seen as associated with 'intelligence'.

6.6. References

Bereiter, C. An academic preschool for disadvantaged children: conclusions from evaluation studies. In J.C. Stanley (Ed.). *Preschool programmes for the disadvantaged.* Baltimore: John Hopkins University Press, 1972.

Creed, C.D. & Robinson, W.P. Intelligence test scores in the evaluation of a 'Use of Language' programme for infant school children. *Res. Education,* 1971, *6,* 1-11.

Douglas, J.W.B. *The home and the school.* London: Panther, 1967.

Douglas, J.W.B., Ross, J.M. & Simpson, H.R. *All our future.* London: Panther, 1971.

Eysenck, H.J. *Race, intelligence and culture.* London: Temple Smith, 1971.

Gordon, H. *Mental and scholastic tests among retarded children.* London: Board of Education Pamphlet, No. 44, 1923.

Gray, S.W. & Klaus, R.A. An experimental school programme for culturally deprived children. *Child Develpm.,* 1965, *36,* 887-898.

Heber, R. & Garner, H. An experiment in the prevention of cultural-familial mental retardation. Proceedings Second Congress, International Association for the Scientific Study of Mental Deficiency, 1970.

Husen, T. *Social background and educational career.* Paris: O.E.C.D., 1972.

Jensen, A.R. How much can we boost IQ and scholastic achievement? *Harvard Educ. Rev.,* 1969, *39,* 1-123.

Robinson, W.P. The dialogue of deficit and difference. *Intern. J. Psycholinguistics,* 1973, *1.*

Robinson, W.P. & Rackstraw, S.J. *A question of answers.* London: Routledge, 1972.

Skeels, H.M. Adult status of children with contrasting early life experiences. *Monogr. Soc. Res. Child Develpm.,* 1966, *31,* 1-59.

Weikart, D.P. Relationship of curriculum, teaching and learning in preschool education. In J.C. Stanley (Ed.). *Preschool programmes for the disadvantaged.* Baltimore: John Hopkins University Press, 1972.

CHAPTER 7 FINDING OUT AND POSING QUESTIONS

7.1 FINDING OUT (W.P. ROBINSON & L. ABRAMSKY)

7.2 COMPETENCE AT QUESTION ASKING AND ITS DEVELOPMENT

7.3 COMPETENCE AT POSING SINGLE QUESTIONS

7.3.1. Competence at question posing: middle school pupils
    Single questions, single answers
    Questions answered in paragraphs (F.M. Freeman)

7.3.2. Competence at question posing: secondary school pupils (F.M. Freeman)

7.4 COMPETENCE AT POSING SEQUENCES OF QUESTIONS

7.4.1. Interrogation strategies and social class (M.G. Duffy)
    (i) Experiment with finite given alternatives
    (ii) Experiment with unrestricted alternatives

7.4.2. Interrogation strategies and social class (F.M. Freeman)

7.5 QUESTIONS IN PROBLEM SOLVING (F.M. FREEMAN)
    Puzzles, helicopters and goal scoring

7.6 OVERVIEW

7.7 REFERENCES

CHAPTER 7

FINDING OUT AND POSING QUESTIONS

Editor's Introduction. Of the many goals of the educational system, one increasingly attributed to it is the development of the general problem solver. While this phrase has the ring of an electronic era, the idea is as old as education itself. 'Problem' in this context is not intended to refer to questions in arithmetic or crossword puzzles, but rather to any activity which requires the selection of some course of action rather than another. Every day we take many decisions, from the mundane whether or not and when to get up through to resolving to become social workers and spouses. As mature adults we have reduced many of these decisions to unconsidered habits; cornflakes, ethics and the treatment of our children may well be routinised

But at some earlier point in time our habits were problems involving choices that we had to make. Did we solve them sensibly? Do we solve our present ones sensibly? To do so requires that we define the nature of the problem, decide what evidence could be important and relevant to its solution, collect, examine and evaluate this information and finally select a solution that we imagine is to be preferred. These processes of analysis, evaluation and synthesis are common to all problems, and if the descriptions of child development offered in Chapter 2 are valid, they have been with each of us from our beginnings. We eventually managed to get food into the mouth, distinguished our mothers from other persons, realised that our feet were attached to the body and increasingly adapted the representations in the head to the world outside. We always have been and always will be problem-solvers. But some problems are more problematic than others and as knowledge has grown, and living in society become more complex, mankind has changed his ways of acquiring, storing and evaluating it in important ways over the centuries.

For many ages much knowledge was stored in the brains of general and specialist experts, philosophers, farmers, blacksmiths, builders and mothers, who passed on their knowledge by example and word of mouth to selected inheritors. With the development of drawing and writing systems, knowledge could also be stored outside human heads, and we have built up a vast heritage of plans, maps, and books in the museums and libraries of the world. We have also created special institutions for education which have placed a heavy premium on the acquisition of skills necessary to tap this knowledge, literacy and numeracy being two objectives claimed for these organisations. Although these activities involve 'knowing how' as well as 'knowing that', they involve a heavy commitment in knowledge of the second sort. One consequence has been that the acquisition and maintenance of factual knowledge in 'essential' subjects came to assume an importance at the cost of teaching children the skills to acquire knowledge. It has been recognised however that knowledge can date vary fast, particularly in the physical and social sciences. Basic concepts and principles can be replaced, basic technology transformed. What is the point of teaching children knowledge that will be of historical interest only by the time they become adults? And how do we know which knowledge will be changed? Alas, we do not and could not know. Hence what we need to do is teach children how to acquire knowledge when they need it.

This is too glib. Much knowledge does not date and will not change. 'Knowing that' is important. My knowledge of the best way to drive from A to B in London may date as a result of one-way systems and street closures, but I do need the facts in my head if I insist upon driving around that town; knowing how to read a map will not be a sufficient substitute because I shall not be accorded the opportunity of stopping at will to ckeck my next turning. The snag is that we cannot predict accurately what will and what will not be useful facts for children when they become adults. A measure of inefficiency is an inevitable price paid because we allow individuals to make choices of subsequent specialisations, careers, residence and life-style, and it is absurd to criticise the system for this conjunction of attirbutes.

If they we can agree that there is a substantial body of fact and skills which it is desirable for all potential full members of our adult society to acquire and know, we can probably also agree that we have, periodically, to examine this body, purge and replenish it. We must not retain 'essential knowledge' that we now find is not essential and we cannot add to the total indefinitely. It is perhaps in part because the purging has not been rigorous enough that the antithetical idea that we should concentrate on teaching skills for acquiring knowledge has arisen. To suggest that both are necessary is not so much a compromise as an obvious piece of commonsense.

And a case can be argued that at this moment in time we do not place sufficient emphasis upon the development of problem-solving skills. Posing appropriate questions is a necessary condition of proficient problem-solving and it is to these interrogatory aspects that this chapter is addressed. Later sections deal with skills at posing questions, but the first one is a preliminary excursion into finding out about children finding out. Posing questions will be in vain if one has no idea how to find out answers to them.

We chose to look at a simple form in this area: the acquisition of discrete pieces of information readily gleaned from observations, persons or from mass media of one kind or another.

We chose ten year olds as the youngest group we imagined would have had both the occasions of meeting problems of the sort we posed and sufficient literacy and instruction to render books a suitable source to use. We chose social class as a possible differentiating variable between children.

7.1. Finding Out (W.P. Robinson & L. Abramsky)

Introduction. Many people think that one of the most important functions of education is to teach children how to find out information they want but have not got and how to master now skills should they ever wish to do so. Knowing how to find out is a particularly valuable skill, if only because we would find it impossible and uneconomic to learn so much that we never had to learn more.

The skill has two basic components which we shall call *strategy* and *source of information.* By 'strategy' we mean the activity in which the person engages in order to find out, *e.g.* observation, experiment, asking, reading, reasoning *etc.* By 'source of information' we mean the particular respondent, book or programme *etc.* to which the person turns for the information. We shall refer to the combination of strategy and source as the *method* so that asking one's parents, reading in a history book and watching and listening to the news are methods.

We wanted to find out the range of methods known to children nearing the end of the middle school phase of their education and for which problems they might use which methods. The age group was selected because we expected all methods to be available to the most advanced ten to eleven year olds and we wished to see whether there were differences among children of the age group. Although we might have been interested in differences associated with age, sex, intelligence or other personality characteristics, we concentrated upon social class, with the particular concern being that WC children might differ from their MC peers.

Since our enquiries were not set in a wealth of accumulated knowledge and we had limited resources, we had to devise our own instruments and could do no more than begin to pose some of the problems in this area.

We did not try to find out which methods children in fact used to answer their questions or even whether they bothered to satisfy their curiosity at all. We would have liked to have obtained such information, but regarded interviews as giving the best return for initial investment. We decided to use only small groups of children to maintain a maximum of homogeneity on other sources of variance such as school experience.

Method

Subjects. The children were drawn from two of four classes in an unstreamed middle school drawing its intake from both a residential area and a council estate in the suburbs of Southampton. Children were screened on Raven's Progressive Matrices, and teachers gave details of fathers' occupations. On the basis of this information an attempt was made to construct groups of girls and boys matched on Raven's scores but different on social class. This proved to be difficult. In the end five MC and five WC girls were extracted, but boys' numbers were so low as to render comparisons impossible. For the girls in the middle class group, the mean age was 10.9, the mean non-verbal IQ scores 116, and fathers' occupations were in Hall-Jones ranking 1 or 2. For WC girls mean age was 10.9, mean non-verbal IQ 113 and fathers' occupations were in Hall-Jones categories 6 except for one in 5b. The girls were clearly well above average ability for their age group.

Materials. The items for the questionnaire were to be presented orally in an interview. Since we were primarily interested in how children would find out what they did not already know, we were obliged to include as many items as feasible for which this would be true. However, in practice the interviewer observed that children found it disturbing not to know the answers to the questions presented. Explanations that we were interested in how children would find out and that the items were deliberately chosen to be outside their knowledge did not allay suspicions and anxieties. Such is our culture! Knowing the answers is what counts. We overcame this difficulty by including some items to which the children would know the answers and then asked them how they found these out.

The items were intended to cover the range of methods we could think of. For most items there was more than appropriate and feasible strategy. We could not prejudge the availability of human sources, but we tried to cover the range of standard reference books and a variety of persons. The main categories covered were observation, experiment, asking a person, looking at books, papers, television or listening to the radio, reasoning and doing. Personal sources likely to be mentioned were parents, peers, teachers, 'experts' and others. Source materials covered were dictionaries, encyclopedias, atlases, and various types of other reference works.

We have mentioned that most items were asked assuming that the child did not know the answer. This apparent clumsiness was intended to help overcome the assumption of children that they should know the answers. When a child gave the answer, she was asked how she had found it out. All questions were probed. All indefinites were probed. All questions included 'Are there any other ways you could find out?'

The Questionnaire

1. You know the Evening Echo newspaper (local paper); how could you find out how much it costs?
2. How could you find out how to bake a cake?
3. How could you find out what the word 'avaricious' means?
4. Cars going in the same direction drive down the same side of the road. Do you know why this is? How did (could) you find this out?
5. How could you find out the results of the Saints match (local football team) next Saturday?
6. There are lots of different detergents for washing clothes. How could you find out whether a particular detergent removes blood stains?
7. There are many different countries in the world; Great Britain, France, Russia, China. There is a country called Peru; how could you find out where it is?
8. Do you know what the word 'greedy' means? How did (could) you find that out?
9. How could you learn to ice-skate?
10. Do you know what colour is made if blue and yellow paint are mixed together? How did (could) you find that out?
11. The planets of the sun are not all the same size. How could you find out whether Jupiter is bigger than Pluto?
12. Do you know what a zebra crossing looks like? How did (could) you find that out?
13. There have been many wars between different countries. How could you find out which armies fought each other at the Battle of Borodino?
14. How could you find out how to mend a fuse?
15. Many things have been happening in Northern Ireland lately. How could you find out just what is happening in Northern Ireland?
16. The earth goes around the sun. Do you know what the moon goes around? How did (could) you find that out?
17. Ships have different coloured funnels. How could you find out the colour of the funnel of the Q.E.2?
18. You hear about Trade Unions. How could you find out just what a Trade Union is?
19. Do you know why we don't wear clothes made out of paper instead of cloth? How did (could) you find this out?
20. How could you learn to play the guitar?
21. Manchester is a town in Britain, Paris is in France. How could you find out what country a town called Canberra is in?
22. There were people who did famous things in the past like Nelson, Napoleon and William the Conqueror. There was once a man called Ghengis Khan. How could you find out what he did?
23. Most eggs are good eggs, but sometimes an egg goes rotten. How could you find out whether an uncooked rotten egg in its shell floats on water or whether it sinks?

Instruction and Procedure. At the time of the administration of Raven's Matrices, children were told that the woman helping would be returning to talk with some of them. She duly returned and spent about twenty minutes interviewing the selected children individually. The official instructions were:

> I'm trying to find out something, and I want your help. I want to know how boys (girls) your age find out about something when they don't know the answer. I've got a list of questions here. I don't expect you to know the answers, but I want you to tell me how you could find out the answers. There are several different ways of finding out things. For example, you could ask someone, you could read about it, or watch television, or you could go and look at it yourself or do it, or you might just think about it and work it out for yourself.
>
> This isn't a test. There are no right answers or wrong answers. You probably *won't* know about lots of these things, but I want you to tell me how you could find out. All right?

The customary checks on understanding were followed by the questionnaire items. The basic procedure was adhered to, but children were not interrupted if they wandered from the questions asked. It seemed to be natural for them to interject with the correct answer if they knew it. They were then asked to recall how they had found out. Whenever indefinites such as 'someone' or vague references to 'a book' were used, a question seeking finer specification was asked, *e.g.* 'Who?', 'What sort of book?'. When the children had finished responding, they were asked, 'Are there any other ways you could find out?' and after the reply to this probe, the next questionnaire item was given. All interviews were tape-recorded.

Treatment of Results. Answers were transcribed and coded in accordance with the frame described briefly below and fully in Appendix 7.1.

The main categories were:

A. Observation
B. Experiment
C. Asking a person
D. Mass media – reading
E. Mass media – television or radio
F. Reasoning
G. Learning through experience
H. No answer or not known
I. Oddments that did not fit into A-H

Persons acting as sources could be specified: 1. Parents, 2. Teacher, 3. Peer, 4. Expert by virtue of special training or experience, 5. Specified other person. These differences could apply to both 'A. Observation' and 'C. Asking a Person'. Where persons were mentioned under G., this was noted in another way. Under both Mass Media categories, subscripts were used to denote specific sources. Under 'G. Learning through experience', distinctions were drawn between just practising alone, learning with the help of a book and learning with the help of a teacher. I. was noted only when an answer misconstrued a question and it did not seem possible to get the child to understand the problem set.

Scores on these categories and sub-categories were tabulated, and where appropriate, Mann Whitney U tests were run to compare the groups.

Each method mentioned was also scored as to how *appropriate* it was, that is, how likely it was to yield the required information, assuming that the source was available. It was also scored in terms of *feasibility,* that is whether or not the child would be likely to have access to such sources or resources. For example, a child might have said he could fly to Northern Ireland to find out what was happening. This would be appropriate, but not feasible. While our judgements were subjective, and some children's pocket money may run to the fare and some parents would allow them to go, we thought it worthwhile to make such assessments. Scores for both ranged from 0 to 2, 1 being used for suggestions with a measure of doubt.

Results

Almost all children could give a reasonable answer to Q.8 about the meaning of 'greedy', but the answers to how they had come to know were sufficiently odd to give cause for worry about other answers requiring recall. One girl 'guessed' it, one had 'thought it out', and one 'had seen it done'. Q.8 was dropped from further analysis.

Table 7.1.1 Incidence of Strategies and Sources for Finding out used by Individual Middle and Working Class Girls

	Individual Children									
Strategy and Source	Middle Class					Working Class				
	1	2	3	4	5	1	2	3	4	5
All Categories	42	49	34	39	41	40	30	31	26	19
Asking Teacher (C2)	2	5	3	3	2	1	0	0	2	0
Asking Expert (C4)	1	2	5	3	5	5*	0	0	1	0
Specific Books (D2, 4, 5, 6)	8	5	3	5	5	3	1	6	3	2
Mass Media (TV) (E)	2	6	1	5	4	0	4	2	2	2
Learning thro' Experience (G)	4	3	4	5	4	3	2	1	3	4
Don't Know/No Answer (H)	0	0	0	0	2	1	4	2	6	10
Agreements with Group (24)	21	18	15	17	19	13	13	17	9	8
Agreement as % Answers	88	75	63	71	86	57	65	74	50	57

*For three of these the expert was 'someone who . . .', *e.g.* 'Find someone who's been to Peru and ask him where it is.'

Certain categories of analysis showed no sign of a differential use by the two social class groups. Of those that were not so rare as to render it foolish to say there were no differences.

Observation (A), Experiment (B) and Reasoning (F) showed little hint of differences, although the last was used six times by MC girls as against three by WC girls. Within 'Asking a Person', while requests to parents (C_1) and peers (C_3) gave no discrimination MC girls were more likely to ask teachers (C_2) ($U = 1.0$, $p = .016$) and specified Experts ($U = 3.5$, $p < .096$). When specific reference books (D_2, D_4, D_5 and D_6) were separated out, it was found that MC girls claimed a relative propensity to consult these ($U = 4.0$, $p = .096$), and they more often mentioned watching television (E), especially for football results and news about Northern Ireland ($U = 2.25$, $p < .056$).

WC girls gave more 'Don't know's' ($U = 1.5$, $p < .032$) and in fact used fewer categories overall ($U = 2.0$, $p = .03$). It would appear to be fair to conclude that the general tendency of MC to mention more strategies and sources is not simply a reflection of greater responsiveness, since the differences are mainly within the particular sub-categories already mentioned.

To answer whether or not there were differences in appropriateness and feasibility, it was first necessary to remove effects contingent upon the greater response rate of MC girls. When this was done, it was found that there were no social class differences; a large majority of responses were both appropriate (MC 89%, WC 88%) and feasible (MC 97%, WC 97%).

By way of a summary analysis we looked to see what the most popular mode of response was for each question — a measure of group consensus. If four or more out of the ten girls used a response it was included. Some questions had more than one popular response, Q's 14 and 18 had none. The array of preferences was:

A. Q's 1 and 17

B. Q's 6 and 23

C. C_4 for Q.1, C_2 for Q.16

D. D_1 for Q's 5 and 15, D_2 for Q's 7 and 21, D_3 for Q.6, D_4 for Q.3, D_6 for Q's 2, 3, 13 and 22

E. Q's 5 and 15

F. Q's 4 and 19

When the groups were compared in the use of these popular responses, MC girls were more likely to use more of them both absolutely ($U = 0.5$, $p < .016$) and as a proportion of non-H. or I. answers given ($U = 3$, $p = .056$).

While the data on appropriateness and feasibility did not show up any class differences, the answers of the two groups felt different. If we examine the two sets of responses below, they illustrate what is meant.

	MC Responses	WC Responses
1.	Go to a newsagent and ask	Ask someone
2.	Ask mother	Ask a friend
5.	Look in the Echo	Go to match
6.	It might say on the packet	It will say on the packet
7.	Look in an atlas	Ask someone who's been on a cruise to Peru
10.	I had a book which showed which colours you mix to make which colours	Just said it

14.	Electrician	Ask someone
15.	TV	Go there
17.	Go to docks while it was there	Go to docks
21.	Look in index of atlas. It would tell you the page and you could look and find what country it was in	Dictionary

This is an illustrative selection not a random sample. What does it illustrate? A difference in precision, appropriateness of qualification, explicitness and specificity, commonsense and perhaps seriousness of intention. If we were to claim that the MC girls took the task more seriously as a set of problem-solving situations, this should be taken to mean that the MC girls reflect upon the answers they think of and check them against the problem. The examples of WC responses above are ineffectual if they are viewed as specifications of sensible plans of action. Would they really try to hunt down a returned visitor to Peru or go to the docks on the off-chance of the Q.E.2 being there? Or are they producing responses to satisfy the interviewer? The lack of explicitness and specificity has been found before (see Robinson, 1972 for a summary). Williams and Naremore (1970) have justifiably criticised such work on the grounds that it is based on the analysis of unchallenged answers. With their subjects, probing removed social class differences. In this study probes did not lead to such an evening out.

Summary. Reports of social class differences with ten subjects should not convince but might excite the imagination, especially since our techniques were unrefined and our subject sample abnormally able. Any elaborated repetition could institute more effective control for differentials. To ask anyone how they did find out something is a strange request. We might well expect that the knowledge we acquire normally becomes dissociated from its context of acquisition. It is hard enough learning without bothering to store the occasion as well. Successful recall by children of how they actually found things out is likely to be of significance only in unusual circumstances.

We must also note that our items of information were within the conceptual grasp of the children, that is it was the content of the specific instance that was unknown not the nature of the class of which it was a member. Hence, in Piagetian terms, our questions were directed at problems of assimilation rather than accommodation. We also took only a snapshot at a moment in time, and did not examine the acquisition of methods of finding out. Chapter 8 provides a preliminary account of developmental changes in preferences of persons as sources.

Whether or not we judge the general efficiency of these eleven year olds to be high or low will depend perhaps on our past experiences of such children. Suffice it to make one favourable and one unfavourable comment. It is true that most of the children could offer one appropriate and feasible method for each of the problem; it is also true that they, particularly the WC girls, were unlikely to mention alternatives. One immediate interpretation would be that the children were constrained by a 'one right answer' mentality. One right answer is both necessary and sufficient. Such a view is consistent with the interviewer's difficulty in persuading the children that it did not matter that they did not know the actual answers to the questions asked. The children felt it was more important to know the answers than to know how to find them out.

Although these children had enjoyed several years of integrated days and a dash of 'discovery' learning, they appear still to be concerned with immediate convergence on unique answers within a context of set problems. They did not wallow in the elaboration of possibilities.

A second interpretation would be that the responses could be viewed as person- rather than problem-centred. Particularly among the working class there was the implicit application of a 'least effort' criterion. What is the minimal acceptable response? Hence, the abbreviated indefinite and vague replies. In Chapter 2, we referred to the hazards of response-based learning as distinct from understanding-based learning. To the extent that we had created an artificial situation and the children were as co-operative as children tend to be, we perhaps unwittingly encouraged the adoption of such an orientation.

Unfortunately the two principles of 'one-answer mentality' and 'least effort' both lead us to expect similar responses in the situation we used. To differentiate between them would require an experimental manipulation. Suffice it to say that one or other or both of these may have been operating and could explain the differential behaviour of the two social class groups as well as the absolute performance, if we had evidence that the WC are more person- than problem-centred. Such evidence was produced in chapter 2.

We did, of course, wish to eliminate these influences since our goal was to find out what strategies and sources children could think of as ways of solving problems. The probing should likewise have encouraged the production of alternatives and an increase in explicitness and specificity. In so far as these objectives were realised, we are justified in concluding that the WC class girls were less able than their MC peers to think of varied and explicit ways of finding out answers to the problems posed.

APPENDIX 7.1

CATEGORIES FOR STRATEGY AND SOURCE

Running through the categories of 'Observation', 'Experiment', 'Asking other people', 'Reading' and 'Other mass media', it was deemed desirable to distinguish active goal-directed attempts to learn and passive reception of information. This latter normally occurred in response to the questions about how children had found out what they already know, *e.g.* 'How did you find out that green is made if blue and yellow paints are mixed together?'; 'I was painting and the blue paint wasn't dry and the yellow ran into it, and it turned green.' However, it was rarely used to refer to a casual hopefulness, *e.g.* 'How could you find out where Peru is?'; 'There could be an earthquake there and you could read where it was in the papers.' This distinction between active and passive learning could be important in other investigations and would need to be elaborated and integrated into any comprehensive coding frame. Here a casual note was made of such passive learnings.

Seven main strategies were distinguished:

A. Observation

B. Experiment

C. Asking a person

D. Mass media – reading

E. Mass media – TV or radio

F. Reasoning

G. Learning through experience

H. No answer or not known

I. Oddments, including, for example, getting someone else to mend a fuse. Responses which did not answer the question as posed were included here.

A. Observation

An answer was categorised as an observation when direct sensory perception of the undisturbed object or event was cited. Any interference would have converted the answer to an experiment. Any ikonic or symbolic representation of it would have placed it in one of the mass media categories. Magnification through telescopes or microscopes was included.

e.g. How could you learn to ice-skate?
I could watch other people do it.

Sources. Subscripts were used to denote who would be watched:

A_1 Parents, A_2 Teacher, A_3 Peer, A_4 Expert by virtue of training or experience, A_5 Specified other person. No subscript was made if the person was unspecified and remained so after probing.

B. Experiment

When some manipulation of the environment by the child was involved, and he claimed to intend to witness the outcome, 'experiment' was scored. No gradation in sophistication was noted, because the ideas in fact proposed were all elementary.

> *e.g.* How did you find out that green is made if blue and yellow paints are mixed together?
> We needed some green paint, so we tried mixing together different colours until we made green paint.
> How could you find out whether an uncooked rotten egg in its shell floats on water or whether it sinks?
> Try it out.

C. Asking a Person

If the child said he would pass the question on to someone this category was scored. We did *not* include cases where he would ask someone to teach him how to do something (see G.).

> *e.g.* How could you find out what a Trade Union is?
> I could ask someone.

Sources were given subscripts corresponding to those in A. Observation.

D. Reading

The decision to divide mass media by skill rather than some other criteria did not matter since subcategorisation separated out categories in such a manner that they could have been recombined along other groupings if so desired. One exclusion from this category was the direct observation of the price of a newspaper, a second was the mention of 'teach yourself' books for guitar and skating, when active participation was also mentioned. At least three sub-categories might need to be included under different headings in other investigations. Newspapers might be combined with radio and TV. 'Labels and instructions on packets' might be distinguished from 'books', as might 'pictures, models and photographs' for which of course reading is not necessary for understanding. However, the questions chosen were such that both D_3 and D_8 were too rare to merit recombinations of any sort.

> *e.g.* How could you find out which armies fought each other at the Battle of Borodino?
> I could read about it.

Sources: D_1 Newspapers, D_2 Atlas, globes and maps, D_3 Labels, instructions on packets and other advertisements, D_4 Dictionary, D_5 Encyclopedia, D_6 Specified category of book (history, space, *etc.*), D_7 Unspecified book, D_8 Ikonic representation (photograph, picture, Model), D_9 Other.

E. Radio and Television

Although sub-categories were used for types of programmes, these were used too infrequently for systematic analysis.

> *e.g.* How could you find out what is happening in Northern Ireland?
> By watching television.

F. Reasoning

Children had difficulty in expressing themselves in terms of sentences like 'I just thought about it', but whenever a child *first* attempted to express such a procedure, the interviewer gave a brief comment that we call this 'thinking' so we could say 'I thought about it'. In practice it was less difficult to pass judgement on this category than might be imagined. When the answer involved 'reasoning' without a subsequent labelling of this, the category was still scored.

> *e.g.* Cars going in the same direction drive down the same side of the road.
> Do you know why this is? x How did (could) you find this out?
> If x were 'It's commonsense, because they'd bump into each other, *etc.* . .
> then this category was scored. If the answer to the second question
> was 'I thought about it', the category was scored.

G. Learning through Experience

Not all the questions involved finding out one-word answers. Two asked about learning complex sensory-motor skills and for these answers fell into three main sub-categories:

G1 Taking lessons, either formal or informal
e.g. By taking lessons. By having someone who knew how teach me how.

G2 Teaching oneself through practice
e.g. By just getting a guitar and trying to play.

G3 Getting a book and teaching oneself
e.g. By getting a book that has notes in it and then trying to play them.

G4 Other

H. No informative response

I. Response not an answer to question posed regardless of probing.

7.2. Competence at Question Asking and its Development

Introduction. You can ask questions to acquire knowledge. Whether you are successful or not will depend upon a variety of factors, one of which will be your skill at formulating appropriate questions. Have you mastered the formal linguistic aspects of question construction? Questions are posed with a limited range of sentence forms whose rules of construction need to be acquired. Lexical items must be available to refer to the objects of inquiry and, if Robinson and Rackstraw (1972) are correct, efficient questioning requires some prior knowledge of *the kind* of answer required. If the occurrence of a question is only possible when there are gaps in a framework of knowledge or belief, then this framework itself will serve as a basis for the evaluation of the satisfactoriness of a particular answer. How and when these skills are acquired are matters for investigation.

In this section we are particularly concerned with social class differences in the competence of the construction and use of isolated questions and sequences of questions. While these studies rely on controlled observation with limited materials and situations, we finish with examples of question-posing in everyday problems. However it is perhaps desirable to preface our own studies with thumb-nail sketches of such work as has been conducted on the development of questioning skills.

The Development of Questioning. Evidence of baby's first questions is scant but neat. With but one child, Menyuk and Bernholtz (1969) showed that the various occurrences of the utterance 'door' fall into three categories marked by differences in duration and intonation. 'Door' as a question 'Is that a door?' was shorter than when it was a statement (That's a door) and when it was an imperative (Shut the door!) and its fundamental frequency rose in the middle and was maintained. We do not yet know whether this swallow will mark the onset of summer. For our knowledge about the earliest stages [illegible]es/No and 'wh' questions, we currently rely on the detailed analysis of the speech of the three children studied intensively by Brown, Bellugi, Cazden and Hanlon at Harvard. Cazden summarises the nature of the sequence observed in all three children (Cazden, 1972, Table 7.2.1.). Interestingly, the stages of preceding mastery of the adult forms are consistent with transformational generative grammar (Brown and Hanlon, 1970).

Ervin-Tripp (1970) has watched the development of the discriminative use of 'wh' questions by five children and monitored the development of comprehension in successive monthly interviews with twenty four others. On the basis of her evidence it would appear that there is a sequence of mastery: yes/no, what, where, what-do, whose, who, why, where from, how, when. The first three had been acquired by two years of age, while eight of the twenty four children had not mastered the simplest form of 'when' question by three years and four months. These ages should be treated as no more than rough guides as to what age children one might select for particular studies and it should also be remembered that other aspects of linguistic expertise are developing concurrently, so that forms where the 'wh' interrogative refers to the object of the answer may be mastered after the case where it refers to the 'subject'.

Of especial interest was the finding that mastery of a particular 'wh' form was not preceded by a stage of random responding and Ervin-Tripp was able to specify a number of strategies which accounted for much, but by no means all, of this non-randomness. Four such strategies were detected (*p.* 96):

Table 7.2.1. Stages in the development of Question Forms

Ages for Adam	Yes-No Questions	Wh-Questions
Period A (28 MOS.)	Expressed by intonation only: *Sit chair? Ball go?*	Limited number of routines: *What('s) that? Where NP go?* *What NP doing?*
	More complex sentences being questioned, but no development of question forms themselves except the appearance, probably as routines, of two negative auxiliaries *don't* and *can't*.	
	Dat black too?	*What soldier marching?*
	Mom pinch finger?	*Where my mitten?*
	You can't fix it?	*Why you waking me up?*
Period C (38 MOS.)	Development of auxiliary verbs in the child's entire grammatical system. Inversion of AUX and subject NP in yes-no questions, but not in Wh-questions.	
	ARe you going to make it with me?	*What I did yesterday?*
	Will you help me?	*Which way they should go?*
	Does the kitty stand up?	*Why the Chirstmas tree going?*
	Can I have a peice of paper?	*How he can be a doctor?*
Period C-F (42-54 MOS.)	Development of tag questions from Huh? to mature form:	Inversion of AUX and subject NP, first in affirmative questions only:
Period D + E	*I have two turn huh?* *We're playing, huh?*	*Why are you thirsty?* *Why we can't find the right one?*
Period F	*That's funny isn't it?* *He was scared, wasn't he?* *Mommy, when we saw those girls, they were running weren't they?*	Later, starting in Period F in negative question also: *Why can't they put on their diving suits and swim?* Development of complex sentences, including indirect Wh-questions: *You don't know where you're going* *He doesn't know what to do* *We don't know who that is.*

Extracted from Cazden (1972)

1. If you recognise a familiar question word, give an appropriate reply. *(By this is meant an answer which contains a grammatically, lexically and semantically appropriate replacement group for that interrogative.)*
2. If there is a transitive verb, respond with the object of that verb. This strategy appeared throughout the range of ages in the large group of subjects and accounted for two-thirds of the replies to 'how' and 'when' questions that contained transitive verbs. The chief defect was that the cause strategy sometimes influenced even transitive verbs. If rules were different for each child we might be able to weight in terms of such pervasive response preferences.
3. If you are over three, and there is an animate subject and intransitive verb, give a causal explanation.

   This accounts for eighty four per cent of the 'how' questions, but no 'when' questions meeting the specifications were asked.
4. For the remaining intransitive verbs, give a location or direction if it is missing.

   This rule accounted for three-quarters of the cases.

Ervin-Tripp does not elaborate upon the characteristics of children in her samples, but, if it is fair to assume that they are not deviantly brilliant, we are justified in anticipating that the majority of ordinary children will have mastered the basic categories of the question-answer exchange by the time they enter the Infant School. No evidence has been presented about the comprehension of disjunctive questions, *e.g.* 'Would you like an apple *or* an orange', or of yes/no demanding forms differing from declarative sentences only in their intonation patterns, *e.g.* 'You are going to the pictures today?' But for yes/no questions based on transformations of preposition, transposition and the addition of an auxiliary 'do' and for questions introduced by 'wh' words, there is evidence of mastery well before age five.

These three studies are based on only nine children, and we may well live to see this orderly picture smudged by the results of subsequent studies, but pro tem we can relax.

Other things being equal, we should therefore expect seven year old children to be proficient in the handling both of questions and their answers. However, given other information about the language development of WC children, we might expect to find that some of them are not proficient. We chose to look at both seven and ten year old children, the first because we were fairly confident of a very high degree of efficiency in MC children, the second to see whether some WC children still remained incompetent. Some of these investigations were not conducted under the auspices of the Schools Council, but will be mentioned because they form the background to the investigations of Margaret Freeman and Michael Duffy.

Basing her design on materials devised by Susan Rackstraw, Margery Heber (1972) compared seven and a half year old MC and WC boys on the oral questions they had about a variety of cut-out pictures stuck on to five 6 x 4½ inch cards, covering the following themes: space, electricity, trees, bees, and musical instruments. In general, the reading ages of the boys were comparable to their chronological ages, and in any case were matched across groups. While there were no social class differences in the total number of questions asked there were substantial differences in other respects. The WC boys produced more statements (in intonation as well as form) instead of questions and a higher proportion of their questions were of the same form indicating a stereotyping absent in MC boys; it seemed as though they wished to do what was 'right', but did not have genuine questions to ask. The questions they produced were less complex grammatically (no more than one main clause) and more of them focused upon perceptual rather than conceptual aspects of the stimuli, *e.g.* 'Are they always green?' as opposed to 'How does it work?'. In this study, the objective evidence pointed to differences in use if not in competence, although it might be argued that the fact that since the WC boys produced a mixture of statements and questions they were still developing the skill. Although there was only a low incidence of grammatically unacceptable forms within questions themselves, the errors which did occur were normally describable in one or other of Brown's (see above) developmentally prior forms. Subjectively, the impression was that the WC boys were less genuinely curious, but were more enthusiastic in their willingness ot co-operate. At age seven then, we might conclude that WC boys are comparatively retarded viz a viz MC boys, but whether or not they are also developing in a different direction we do not know.

7.3. Competence at Posing Single Questions

7.3.1. Competence at Question-Posing: Middle School Pupils

In section 7.2. we have seen that there is some evidence for a developmental sequence in children's capacities to produce questions and that at the formal level this sequence is consistent with generative transformational grammars. Further, there may be a set order in which questions utilising the special interrogative 'wh' words appear and this may be related to difficulty of the underlying concepts. Social class differences are consistent with the idea of a developmental lag in the working class, at least as far as the formal requirements of questioning are concerned. But is there a similar lag in the semantic and pragmatic aspects of questioning such that WC children are less likely to be able to formulate questions that will evoke the type of answer wanted? Given that there is something a child wants to know, can he frame a question that could evoke an appropriate answer?

Single Questions, Single Answers

To attempt to answer this question Susan Rackstraw (1972) devised a technique whereby children were provided with statements but had to construct questions to which the statements could be answers. Children aged ten had no difficulty understanding the nature of the task, but with several variations in the form of the answers and a wide coverage of 'wh' words, she found a number of social class differences. The results are best summarised by stating that WC boys were the deviant group when comparisons were made by class and sex. They were less likely to produce questions, were somewhat more likely to 'underquestion', and substantially more likely to 'misquestion', *i.e.* in particular their questions were employing the wrong 'wh' form. Conversely expressed, MC boys were more likely than WC boys to generate 'acceptable' questions that should indeed have obtained the answers provided. Grammatical features were not pronouncedly different across the groups, although WC children were more prone to give questions whose tenses were discordant with those of the answers.

This work was extended in two ways by Margaret Freeman. With the same subjects as Susan Rackstraw, Margaret Freeman attempted to find out whether the same social class differences would occur if questions had to be asked about cohesive prose material.

Questions Answered in Paragraphs (F.M. Freeman)

Rackstraw's results indicated the extent and nature of the social class differences to be found when single questions were required for isolated single answers varied along a number of linguistic parameters. But what happens when answers are embedded in a context? Could these children see a corpus of speech as a set of answers to a series of questions? Any statement made in declarative form can be viewed as one of several answers to a set of questions. 'The cat is sitting on the mat' can be an answer to a number of questions 'Where is the cat?', 'What is on the mat?', 'What is the cat doing?'. Which in particular is usually signalled by the patterns of stress and intonation. Once children could grasp the idea of writing down questions answered in a text, would there be social class differences in their prowess at it and would this differ with the type of text?

Arguing in a similar vein to the last investigation, we would expect MC children to be more successful in the number of questions they could generate, the grammatical and lexical appropriateness of their questions, and the semantic linkage between questions and materials in the passage.

Method

Materials. One descriptive and one narrative passage, each approximately seventy words long, were selected. The descriptive text was taken from 'Our Earth' in the 'How and Why' series of children's books; the narrative passage from 'Rupert Annual – 1968'. Both were judged to be within the children's understanding, both had some intrinsic interest. The actual texts were:

> Badger (referred to as Nar.)
>
> 'In the early days of the railways, James Badger lived in a house near the Nutchester line. Early one morning he saw that a landslide had blocked the track, so he dashed along with a lantern just in time to save the train. The people of Nutwood were so proud of his deed that they gave him a medal. James was quite a hero in the village'.
>
> Quicksand (referred to as Des.)
>
> 'Quicksand looks like ordinary sand, which is why unlucky animals, and sometimes people stumble into it by mistake and sink. Unlike grains of ordinary sand which have sharp edges, quicksand grains are round. There is water underneath which separates them and lifts them up – in a sense it 'floats' them – and thus the sand cannot take solid weight. Any heavy object that falls into quicksand sinks as though through water, but much more slowly'.

Subjects. Two local mixed primary schools were selected for the experiments, one situated in a MC district, the other in a WC area. The majority of the parents of children in the MC sample were members of staff at the University, and the children lived in residential districts, whilst the parents of the WC children were mainly manual workers, many of them connected in some way with the docks. The two groups of children were controlled for age (ten to eleven), tasks being performed by the top stream of the final year in each school. Information was obtained from the schools about the occupations of both parents of every child, and classification was made according to the Hall-Jones Scale. Three immigrant children from the WC sample were withdrawn, and so also were two children classified in the lower status range, but whose mothers held higher status occupations.

The final sample consisted of twenty seven children from each of the two schools, (fifteen boys and twelve girls in each). In the MC sample, children ranged from social classes 1-4, ($\bar{X}$ boys = 1.8; $\bar{X}$ girls = 2.0), and in the WC sample, from classes 58 -7, ($\bar{X}$ boys = 5.6; $\bar{X}$ girls = 5.4).

Instructions and Procedures. While it would have been preferable to have reversed the order of presentation for half the subjects, this was administratively impossible. Children were issued with copies of both paragraphs which remained available to them throughout. After initial instructions had been given, the Badger text was read aloud and the children spent five minutes writing down questions answered in it. The procedure was repeated for the Quicksand text. The instructions were:

> 'Now we have two paragraphs. The first is a story, the second a descritpion. You have five minutes for each. I will read through them and then you write down questions answered in the paragraphs. Write your questions in the large space underneath each. We'll start with the story. I'll read it aloud while you look at it. (Story is read). Has anybody any questions?' (Although these sound abrupt it should be remembered that children had already been performing similar tasks. Questions about procedure were answered and the experimenters quickly checked that all children were doing the right thing). 'Right then, start away'.

After five minutes the children were stopped.

> 'Now the description. You follow while I read it aloud. (Description is read). Any worries? Good. Write down the questions then'.

The two experiments were completed by the classes as a group in their own classrooms during what would have been lesson time. The teachers were absent, and the experimenters, both of whom were female, attempted to induce a friendly, relaxed atmosphere into the proceedings, whilst at the same time, being firm regarding such noise and chattering as developed.

Treatment of Results. The narrative and descriptive passages were analysed separately for the boys and girls of each social class group.

1. The total number of questions of each child was counted and entered into a three-way analysis of variance with two values of each variable (sex, social class, type of passage).
2. As for 1, but only questions which were grammatically acceptable, other than having question marks or capital letters missing, were used.
3. 'Imperfect' questions generated by each child were divided into four categories:-
    - (i) Spelling mistakes.
    - (ii) Grammatical mistakes.
    - (iii) Presupposition. *e.g.* 'What did they give him?' 'Have they sharp edges?'
    - (iv) Questions not answered in the text. *e.g.* 'In what century did he live?'

Spelling and grammatical mistakes were later categorised together, and a three-way analysis of variance done.

It was noticed that most of the 'mistakes' occurred in Category (iii), and so further calculations were made. If the presupposition in the question referred to something stated or implied in the previous question, this second question was counted to be correct, *e.g.* Q.1 'Where did *James Badger* live?' Q.2 'What did *he* see early one morning?' Q.3 'What was *he* carrying?' Question 2 can now be marked correct as 'he' refers back to stated James Badger in Question 1. Question 3 can also be marked correct, since 'he' again refers to James Badger implied in Question 2. If the presupposition in the question did not refer back to something stated or implied in the previous question, the question remained noted as incorrect, (iii) *e.g.* 'Do *they* sink?' (Meaning people/animals), Q.2 'Are *they* like ordinary grains?' (Meaning grains of quicksand). On the basis of these further calculations, two more three-way analyses of variance were done, one which dealt with 'acceptable' questions of the second kind, and another which examined the total amount of presupposition generated by the children.

4. The final stage was to try and find out if the children found it more difficult to ask questions, the answers to which were expressed through different and possibly difficult grammatical structures. Also, did they avoid any particular type of question? Each paragraph was divided into eight sections, three of which were sub-divided. This covered every important point of information upon which relevant questions could be asked. They were scored irrespective of spelling, grammatical or presupposition msitakes, and to obtain a full score of twelve, questions had to be attempted on each point. Some children asked more than one question on the same topic, and a cross was put against their score to indicate this. The division made of the paragraphs was:

Narrative passage

A 'In the early days of the railways . . . .
B(1,2) . . . . James Badger lived in a house near the Nutchester Line.
C Early one morning . . . .
D(1,2) . . . . he saw that a landslide had blocked the track.
E So he dashed along with a lantern . . . .
F . . . . just in time to save the train.
G(1,2, 3) The people of Nutwood were so proud of his deed that they gave him a medal.
H James was quite a hero in the village.'

Descriptive passage

A 'Quicksand looks like ordinary sand . . . .
B(1,2) . . . . which is why unlucky animals and sometimes people stumble into it by mistake and sink.
C(1,2) Unlike grains of ordinary sand which have sharp edges, quicksand grains are round.
D There is water underneath . . . .
E(1,2, 3) . . . . which separates them and lifts them up – in a sense it floats them. . . .
F . . . . and thus the sand cannot take solid weight.
G Any heavy object that falls into quicksand sinks, as though through water . . . .
H . . . . but much more slowly'.

A final analysis dealt with the results obtained by these calculations.

Results

1. MC children asked *more questions* than WC children ($F = 38.75$, df 1/50, $p < .001$), and girls more than boys ($F = 4.88$, df 1/50, $p < .05$). The Narrative passage evoked more questions than the Descriptive one ($F = 5.47$, df 1/50, $p < .025$).

2. If problems of presupposition are ignored and grammatically acceptability of questions as independent units is applied as a criterion, the only significant difference lies in the higher number of acceptable questions being constructed from the Descriptive passage.

3. (i) and (ii). Looking at the less than perfect questions, there were no significant main effects on Spelling and Grammar, although there was a Class x Passage interaction with

Table 7.3.1. Mean Numbers of Questions Asked as a function of Type of Passage, Sex and Social Class

		Type of Passage		Totals	N
Social Class	Sex	Narrative	Descriptive		
Middle	Boys	8.06	8.07		15
Middle	Girls	9.58	9.58		12
Working	Boys	5.07	4.47		15
Working	Girls	6.67	5.42		12
Middle		9.04	8.74	17.78	27
Working		5.78	4.89	10.67	27
	Boys	6.84	6.27	13.11	30
	Girls	8.13	7.50	15.63	24

MC children generating relatively more accurate questions to the Descriptive passage ($F = 5.78$, df 1/50, $p < .05$).

3. (iii) Questions involving all forms of presupposition were more common in response to the Narrative than the Descriptive passage ($F = 42.42$, df 1/50, $p < .001$). However, these MC children were much lower on the 'illegitimate' forms of presupposition, *i.e.* those where the referent could not be found in an earlier question of their own ($F = 17.45$, df 1/50, $p < .05$), while girls were lower than boys.

4. Figure 7.3.1. illustrates the social class differences observed.

Nine of the differences were significant, seven of these on the Descriptive passage:

Narrative passage

(Cat.D2)	Reference to blocking the track.	$p < .05$
(Cat.F)	Reference to saving the train.	$p < .02$

Descriptive passage

(Cat.C2)	Reference to the shape of quicksand grains	$p < .001$
(Cat.D)	Reference to the water underneath	$p < .001$
(Cat.E1)	Reference to separating the grains	$p < .001$
(Cat.E3)	Reference to floating the grains	$p < .001$
(Cat.F)	Reference to the sand taking solid weight	$p < .05$
(Cat.G)	Reference to heavy objects falling into quicksand	$p < .01$

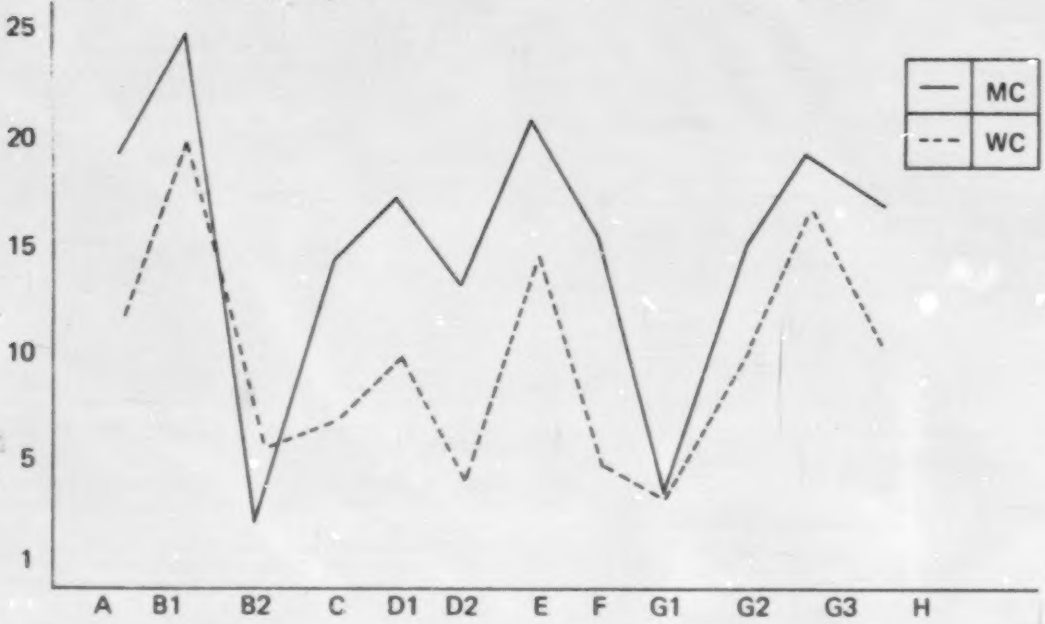
If we ask why these questions should differentiate rather than the others, we might guess that WC children are more likely to ignore the middle section of passages and do this especially if the task is a difficult one (see Discussion).

Discussion

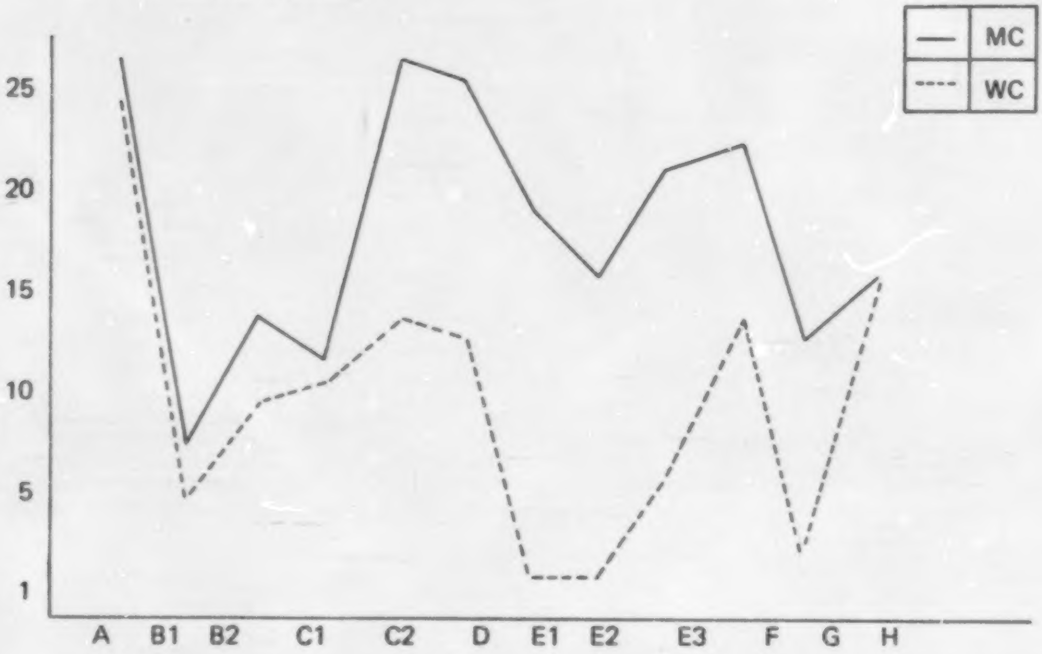
Our expectations that MC children would be able to generate more questions than their WC counterparts proved to be correct. The analysis also showed that girls asked more questions than boys, and that the children seemed to find it easier to ask questions about the narrative passage. There was no significant social class difference in the numbers of spelling and grammatical mistakes made by the children. What was more unexpected, however, were the results obtained in the analysis of the amount of presupposition used.

Figure 7.3.1. Distribution of Questions across Information Points of the Narrative and Descriptive Passages by Social Class

Ref: Narrative passage



Ref: Descriptive passage



X^2 analyses show nine of these differences to be significant, seven of them on the Descriptive passage.

It was expected that WC children would use this more often, but in fact the results indicated the opposite. As the paragraphs remained in front of the children throughout the experiment, it is possible that certain instances of this were considered by the children to be appropriate, which is why we decided upon two categories of 'presupposition'. When this was done it was found that MC children were particularly prone to presuppose items their own questions had already mentioned, while WC children used more unlocatable presupposition, which is consistent with the hypothesis that it is inappropriate contextual presupposition that differentiates between the classes.

The differences between the tasks are consistent with the view that question-posing for the Descriptive passage was more difficult and the results obtained are consistent with the view that the more difficult passage highlights the social class differences more strongly. In this case however the difficulty appears to reside in the type of discourse rather than in the special interrogative forms associated with different types of question.

7.3.2 Competence at Question Posing : Secondary School Pupils (F.M. Freeman)

In the last section we have described our investigations into the competence of ten year old WC and MC children to formulate questions in linguistically appropriate ways on given points of information.

The two experiments to be described here were designed to extend the scope of these investigations. For, although it is important to discover whether, when confronted with pieces of information of varying degrees of complexity, a child is able to formulate the correct questions to which these information points are the answers, this would not be a very common occurrence in real-life situations. That is, after reading a story or seeing a film or television programme, providing sufficient stimulation has been produced to ask questions, it is more probable that the questions asked would be about things extraneous to the stated content of the book or film. For example, if on a news bulletin it was announced that 1,000 American soldiers were being sent to Sandakan, an information-seeking question would more likely be 'Where is Sandakan?' rather than 'Where are 1,000 American soldiers being sent?', or 'Who is being sent to Sandakan?'. Thus the question is asked about a missing piece of information, or one about which the questioner is not certain – a frequent occurrence in everyday life, not only through lack of knowledge, but also because of interruptions such as coughs and traffic noises, or gaps caused by bad telephone connections or the occasional word illegibly written.

In these two experiments, therefore, we attempted to design tasks in which the important information points were missing. In the first, subjects were presented with a set of sentences from which some of the words had been blocked out, and in the second, a short story, also with several words blocked out. Each subject was required to write down the questions they would have to ask in order to find out what the missing word or words were. It was expected that children of higher IQ would be able to perform the tasks better than those of lower IQ, and in view of our previous results which indicated that MC children were more competent than WC children at finding and asking well-formed questions about stated points of information, we also expected to find a social class difference. Because there was a continuous theme in the second task, rather than a corpus containing unrelated sentences, we expected it would be easier.

Method

Materials. Both experiments were designed to cover a wide range of possible interrogatives for subjects to use, *i.e.* who, why, when, where, what (identification), what for (explanation), which, how (degree), how (manner). The first task consisted of nine unrelated statements, each with a gap which should have contained an important information point. The second task was a short story of approximately one hundred words, again with nine gaps in places of various points of information. The content of the two tasks was as follows –

Task 1

Example:

'My name is ______'

Q. '*What* is your name?'

1. Last weekend, I went to see ______ who lives with her mother in Winchester.

   Q. ______________________________

2. John always takes the short cut through the fields so that he can ______.

   Q. ______________________________

3. ______, when I go to town, I promise to return the books to the library.

   Q. ______________________________

4. The cinema is by the ______ on the right, past the Post Office in town.

   Q. ______________________________

5. My watch is slow, but I think it's nearly ______ o'clock.

   Q. ______________________________

6. The two red switches on the side of this tape recorder are to ______ the volume.

   Q. ______________________________

7. As you know, there are several L.P.'s by the Beatles, but we have decided to buy ______ one.

   Q. ______________________________

8. It isn't far to Sara's house, and if you take the path by the canal, it will only take you ______ to walk there.

   Q. ______________________________

9. This new oven is easy to use, because it works by ______.

   Q. ______________________________

Task 2

It was nearly ____ (1) ____ o'clock. Peter was becoming very worried ____ (2) ____, and the football field was ____ (3) ____ miles away from the town centre. There were buses every ten minutes and John was usually on the ____ (4) ____ one. He looked at his ____ (5) ____. Suddenly, Peter heard someone call his name, and turning round he saw ____ (6) ____. John was standing ____ (7) ____ him, next to a shining new motor bike. He explained that the back seat was ____ (8) ____, and told Peter to jump on. John had only passed his driving test ____ (9) ____ month, but nevertheless he rode very ____ (10) ____.

1. *What time was it?*
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________

Both tasks were considered to be within the comprehension of the subjects, and it was hoped that Task 2 might have the additional merit of being interesting.

Subjects. A large mixed neighbourhood comprehensive school was selected. It is situated between a working class council housing estate and a middle class residential district. It was hoped therefore, that the school would include children from the different social classes within its catchment area. The original sample consisted of the entire third year, divided into seven sets. This yielded 168 boys and girls with an average age of 13.5. As we wished to use IQ as a variable and control for it, the Raven's Progressive Matrices were administered to all subjects. IQ equivalents were calculated. In matching groups, tolerance limits of four points were allowed. Information was obtained from the children about the occupations, if any, of both parents, (included in the questionnaire which the subjects completed after finishing the tasks) and classification was made according to the hall-Jones scale. It was hoped that this original sample of 168 subjects would provide us with several comparison groups whose performances we could examine on the basis of social class and IQ. However, this unfortunately was not the case. We were unable to obtain background information for twenty-one subjects, and we found an unfortunately low percentage of MC children, especially boys, in the sample. There were only three MC boys (social classes 1-4) with IQ's over 100, and only one MC boy with an IQ of less than 100. Similarly, there was only one MC girl with an IQ of less than 100. Subjects classified in the lower status range, whose mothers held higher status occupations, were withdrawn from the sample, as also were subjects who obtained inconsistent results on the Ravens Matrices.

The final sample, therefore, consisted of only thirty girls who were divided into three groups:—

Group A included 10 MC girls with high IQ scores; ($\bar{X}$ Social Class = 3.1, $\bar{X}$ IQ = 116.6)

Group B included 10 LWC girls with high IQ scores; ($\bar{X}$ Social Class = 6.2, $\bar{X}$ IQ = 116.3)

Group C included 10 LWC girls with low IQ scores; ($\bar{X}$ Social Class = 6.1, $\bar{X}$ IQ = 94.75)

Instructions and Procedure. For both tasks, subjects were asked to write down the questions it was necessary to ask to fill in the missing gaps. They were allowed ten minutes to complete the first task. and a further ten minutes for the second task. The specific instructions were as follows:–

> (All subjects were given a three page booklet.)
> 'In front of you, on the first page, you can see several sentences. As you will notice, some of the words have been blocked out. In the space under each sentence, I want you to write down the question you would have to ask to find out what the missing word or words are. I *don't* want you to try to guess what the words are. Let's look at the example.
>
> 'My name is ______ '
>
> What is the question you have to ask to find out what the missing word is? That's right – "*What* is your name?" Does everybody understand what to do? Right, carry on – you have ten minutes.' (Subjects complete Task 1)
>
> 'Will you now turn to page 2. This is just the same, only instead of single sentences, we have a short story. In the spaces at the bottom of the page, will you do exactly the same as before – write down the questions you would have to ask to find out what the missing words are. You can see, the first one is already done for you. If there are any you can't do, put a cross against that number. Does everybody understand what to do? Right, will you start now please. You have ten minutes.'

After finishing this task, subjects then completed the third page of the booklet, the content of which was as follows:–

NAME .... *AGE* .... *FORM/SET* ....

1. At what age do you think you'll leave school?

2. What job do you think you will do afterwards?

3. What job does your father do at present?

4. Does your mother work? ______

5. If yes, what job does she do?

6. When you choose a job, which of the following will be important to you? Put a 1 by the most important, a 2 by the next important, *etc.*

Good money ______________
Steady job ______________
Manual work ______________
Easy work ______________
Nice mates ______________
Travel around ______________
Office work ______________

Treatment of Results. The first stage was to score the total number of completely correct questions generated by each child on each of the two tasks. A two-way analysis of variance was then calculated with a factorial design of 3 x 2. Factor 1 comprised the three groups of subjects, A, B and C – a mixed factor of IQ and social class, which it was necessary to employ because of our difficulty in obtaining a larger male differentiated sample. Factor 2 consisted of the two; tasks performed by the subjects – the unrelated sentences and the short story. To obtain a more specific interpretation of these results, we employed the Newman-Keuls procedure, which tested the means of our three groups of subjects.

2. We then scored the scripts a second time, and in this instance, in addition to the 'correct' questions of the previous analysis, we also included in the total for each subject, questions which contained spelling mistakes, and 'bizarre' questions. A 'bizarre' question was one which, in effect, would give the required answer to fill the gap left by the missing information point, but was one which appeared to be a lengthy and somewhat complicated method of achieving this end. For example, in Task 1 an expected question would have been, 'Where is the cinema?'. A 'bizarre' example was 'What is it that is on the left of the cinema, past the Post Office in town?' Again a two-way analysis of variance was calculated, with a similar factorial design as in the first analysis, and the Newman--Keuls procedure was applied to the means of the three groups.

Results

Correct questions. There was a significant difference between the subject groups in the number of semantically efficient and grammatically acceptable questions produced (F = 5.20, df 2/27, p <.05). When the Newman-Keuls procedure was applied to the variation only the difference between Groups A and C remained significant (p <.05); the MC high IQ group producing more correct questions than the LWC low IQ group (see Table 7.3.2).

Table 7.3.2 Mean Correct Questions for Discrete and Textually Embedded Questions by Social Class and IQ

	Group Scores			
Task	MC High IQ	LWC High IQ	LWC Low IQ	Total
Individual questions correct	5.2	5.0	3.7	9.0
Embedded questions correct	7.7	7.0	4.5	9.0
N	10	10	10	

Effective questions. When spelling mistakes were ignored and 'bizarre' but semantically effective constructions were discounted as errors and included as correct, similar results were obtained. A significant difference overall was a function of the superior performance of the MC High IQ group over the LWC Low IQ group (p <.05). Again the Embedded questions proved to be easier than the Discrete ones (F = 10.24, df 1/27, $p < .01$) (see Table 7.3.3).

Table 7.3.3 Mean Efficient Questions for Discrete and Text Embedded Questions by Social Class and IQ

	Group Scores			
Task	MC High IQ	LWC High IQ	LWC Low IQ	Total Possible
Discrete questions effective	7.0	6.3	5.4	9
Embedded questions effective	8.3	7.7	6.7	9
N	10	10	10	

Comment. In the two sets of calculations only the combination of low IQ and social class discriminates between groups. These results differ from those with the younger children where class discriminated in its own right.

7.4 Competence at Posing Sequences of Questions

Editor's Introduction. Mosher and Hornsby (1966) examined age-linked differences in the strategies children employed in a variant of 'Twenty Questions', a game in which the solver has to ask a series of questions which can only be answered with a 'Yes' or a 'No' to find out the solution. This is a game with a predetermined and unique solution; a puzzle requiring 'convergent' rather than 'divergent' thinking. If success is defined in terms of the minimum number of questions necessary to attain the solution, it is possible to specify types of strategy and evaluate their efficiency. Proficiency at the task will be a joint function of adopting the best strategy and being able to group and classify attributes in the array according to the most differentiating criteria, *e.g.* to spot an attribute that divides the remaining possibilities into equal halves. Guessing what object or idea an experimenter has in his mind may seem to be far removed from everyday life, a piece of arbitrary artificiality, but we can quickly see that this is not so. If we consider the vast array of both natural and constructed objects in our environment and realise that these develop faults which require diagnosis and repair, we can ask ourselves how far the strategies of thinking necessary for success in the parlour game are essentially the same as those that confront doctors, mechanics, television repairers — in fact all maintenance and administrative personnel both professional and amateur. It is, of course, very common to have pre-established routines for diagnosing faults in machinery, tests which work down from the general area in a system to particular loose screws or vitamin deficiencies. Similarly, instructions for using instruments and machinery can be formulated as a succession of checking questions organised into a flow chart. All routing of persons by government agencies required to receive or dispense money or documents can be reorganised as diagnostic and prescriptive problems for which algorithms with Yes/No questions provide a simple and efficient means of achieving speedy and correct solutions (see Lewis, Horabin and Cane, 1967; Wason and Johnson-Laird, 1972, or even copies of the Consumer Association publication 'Which'). We have unfortunately hardly begun to simplify our administration in these ways.

With regard to strategies used, we are finally impressed by the car mechanic, who announces that 'It's the rear swivel under the crankshaft attachment lever' in response to some vague comment about 'It sounds like bee's buzzing', only if he is right. If wrong, the specific guess does not carry the diagnostic puzzle much nearer solution. Hence a major division into *constraining* strategies that move from general to specific and *hypothesis scanning* strategies that jump from specific to specific. Clearly a knowledge of types of possible solution and correlated types of strategy is only useful if one has an associated knowledge of the content area of the problem as well; a modest expertise in thinking processes is of no use if you do not know the difference between a distributor and a carburettor (a recent personal problem). All three features are necessary conditions for success. Mosher and Hornsby (op.cit.) constructed an array of coloured drawings of forty two common objects (*e.g.* hammer, gloves, doll) which could be grouped into higher-order categories (*e.g.* tools, clothes, things you can eat, 'red', pairs). In the first run of questioning, children were allowed an unlimited number of questions to find out what the experimenter had in mind, in the second they were confined to ten. While the results are presented less rigorously than ours, we can quote that in their first experiment hypothesis scanning was used ninety per cent of six year olds, twenty five per cent of eight year olds while among eleven year olds it occurred only as 'a scattering of temptation unresisted'. For constraint questions the inverse held. The number of questions necessary to achieve solutions were twenty six, fifteen and eleven respectively. While similar results were found in the second experiment, the eight year olds showed a higher incidence of hypothesis scanning; although they continued to open with constraint questions they did not proceed to *narrow* (funnel) as the eleven year olds, but switched to specific guesses.

While 'Twenty Questions' has a visibly finite number of possible solutions, a second puzzle had neither. After a practice trial, children were given a brief outline of a car crash and had to question the experimenter with closed questions to ascertain how the accident happened. In this activity the eleven year olds continued to operate mainly with constraint questions (sixty per cent), but eight year olds did not (thirty three per cent). They behaved more like the six year olds. When asked whether they had a system, the six year olds said they did not, sixteen out of twenty-eight eight year olds claimed to have one, but for most of these it consisted of working out the most likely cause of the accident, whereas fifty per cent of the eleven year olds explicitly mentioned the idea of starting with broad questions and narrowing down. The 'intermediacy' of the eight year olds' performance is further illustrated by their stated preference for a general rather than a specific question when asked to say which was likely to be more useful. At six only a minority of children made this choice, while all eleven year olds did and gave appropriate justifications.

Mosher and Hornsby concluded that, while six year olds do not have adequate categories of grouping or strategies for interrogation, eleven year olds have both. The eight year old can manifest their developing skills on pictorial material with arbitrary solutions under relaxed conditions, but their efficiency drops once the 'load' is increased by reducing the numbers of questions allowed, switching to verbal 'absent' materials having solutions where empirical likelihood can influence behaviour.

At least one rider is in order. Mosher and Hornsby were interested in the development of thinking skills and attributes of knowledge represented and chose six, eight and eleven year olds, as groups between which interesting differences were likely to occur. The sequence and change is what is important, not the actual ages. Three additional points may be noted about their children: they were middle class (*p.* 85 *op.cit.*), scored about 120 on intelligence tests, and had practised with groupings of the cards in another experiment immediately prior to 'Twenty Questions'. These points are made in jingoistic anticipation of the somewhat poorer performance displayed by British fourteen year olds!

7.4.1 Interrogation Strategies and Social Class (M.G. Duffy)

Introduction. The experiments reported here follow, with slight modifications, the procedure used by Mosher and Hornsby (1966), which employed the game of 'Twenty Questions' to investigate how children of different ages went about seeking information. The rules of the game require that one person should try to obtain some information from another by asking questions which can only be answered 'Yes' or 'No', using as few questions as possible. The efficiency with which this can be done thus represents a basic interrogatory skill.

According to Mosher and Hornsby, there are two 'ideal' strategies for playing the game, 'constraint-seeking' and 'hypothesis-scanning'. The first involves starting off with a very general, wide-ranging question about a class of objects or events, and then gradually narrowing down the range of possibilities until the solution is reached. The second involves merely a testing of successive specific hypotheses until the correct one is arrived at. Constraint-seeking should, in the long run, be the more efficient strategy: its main advantage is that a question which is answered 'No' may provide as much information as one answered 'Yes', whereas if a specific hypothesis is rejected, the information thus gained is negligible.

In this study, the subjects were fourth-form boys, and the main independent variable was social class. Results obtained by Olver and Hornsby (1966) suggest that subjects are able to form a large variety of equivalence classes by age eleven, so the present subjects should have at least satisfied this precondition for playing the game efficiently. The purpose of the experiments was to discover how efficiently teenagers of various social-class groups can obtain information by asking questions, and how efficiently they can use the information thus obtained. Of the two experiments, the first involved the simpler task: the subjects had to find out which one of an array of pictures the experimenter was thinking of, while in the second, he had to find out the cause of a road accident briefly described to him. Thus, in one, the possible alternatives were given and their number was fixed, while in the other, the possibilities were unrestricted, and had to be 'constructed' by the subject.

7.4.1 (i) Experiment with Finite and Given Alternatives

Method

Materials. An array of forty-two familiar objects in a 7 x 6 matrix, similar to that used by Mosher and Hornsby was used. The objects lent themselves to a variety of superordinate groupings in terms of perceptual, functional and nominal attributes.

Subjects. Twenty-four fourth form boys were used as subjects. They were divided into three equal social-class groups, on the basis of father's position on the Hall-Jones Scale of Occupational Prestige, Group 1 (MC) being selected from a different school from Groups 2 and 3 (WC). To control for the effects of intelligence, each subject was matched with one in each of the other groups on the basis of raw scores on the Raven's Standard

Progressive Matrices (sets A – E), which were administered shortly before the experiments were carried out. Because Group 1 were tested at an earlier stage in the school year than Groups 2 and 3, their ages were substantially lower.

Table 7.4.1 Characteristics of Subjects

		Group		
		Middle (1–4)	Upper Working (5b)	Lower Working (6–7)
Raven's Score	$\bar{X}$	47.74	47.75	48.12
	sd	3.39	4.17	3.90
N		8	8	8

Procedure. Each subject was seen individually. He was allowed to look at the pictures to ensure that he could identify them, and any queries were answered. This also gave him an opportunity to arrange the objects mentally into superordinate categories if he wished.

When he had finished looking, the following instructions were given:

> 'I have one of these pictures in mind, and you have to find out which one it is by asking me questions which I can answer either 'Yes' or 'No'. These are the only answers I can give, and your questions must be about the objects themselves, not about their position on the card. You can ask as many questions as you need, but the aim is to find the answer in as few questions as possible. As soon as you think you know what the answer is, ask 'Is it such-and-such?', and if you're right, we go on to the next problem. Any questions?'

After a subject had solved the first problem correctly, he was asked to repeat the same thing twice more. To prevent cheating, there were eight different sets of correct answers, these sets being assigned randomly to subjects within each group. Each subject was informed of this when the procedure was completed and asked not to discuss the experiment with other boys. The entire procedure was taped, although some extra data were recorded on the spot.

Treatment of Results. The indices of proficiency which were validated against chronological age by Mosher and Hornsby were used against social class here. They were:

1. The total number of questions required to obtain the three correct answers.
2. The percentage of constraint questions asked out of the total number. These were questions to which a 'Yes' reply would not of itself provide the correct answer.
3. The 'breadth' of the first question, *i.e.* the maximum number of pictures which a 'No' reply would eliminate.
4. The incidence of 'narrowing', – following one constraint question with another.

Results

Social Class. As Table 7.4.2 shows, the index of social class was not simply related to any of the aspects of questioning scored, the number of questions asked, the incidence of 'constraint' questions, the 'breadth' of first questions, or the incidence of 'narrowing'. No differences were significant.

Table 7.4.2 Characteristics of Questions of Children of Three Social Classes over Three Trials of 'Twenty Questions'

		Social Class		
		MC	UWC	LWC
Questions	$\overline{X}$	52.37	41.62	40.00
	sd	27.90	14.21	18.15
Percentage of 'constraint' questions	$\overline{X}$	33.88	50.22	45.80
	sd	23.17	17.92	17.26
'Breadth' of first question	$\overline{X}$	16.75	12.50	12.00
	sd	11.85	3.04	3.74
S's 'narrowing'		2	4	3
S's not 'narrowing'		6	4	5
N		8	8	8

Intelligence Test Scores. To assess the effects of intelligence test scores on the first three dependent variables, scores for all subjects were pooled, and the product-moment correlation coefficients between these and Raven's Matrices scores were calculated. Raven's scores were unrelated to the number of questions ($r = -.03$) or the percentage of 'constraint' questions ($r = .14$). Higher Raven's scores were associated with the 'breadth' of the first question ($r = .48$, $p < .05$) and boys scoring above fifty on Raven's ($N = 9$, 7 narrowing, 2 not) were more likely to use 'narrowing' than those below fifty ($N = 15$), of whom only two did (Fisher Exact Probability Test, $p < .005$).

Practice Effects. Again, all results were pooled, and performances on the first and third runs in terms of percentage 'constraints' and 'breadth' of first question were compared by means of t tests. In each case the value was non-significant ($t = 0.64$ and 1.10 respectively, df 46).

7.4.2 (ii) Experiment with Finite and Given Alternatives

Method

Subjects. The subjects and groups were the same as for the previous investigation.

Procedure. The experiment was carried out with each subject immediately after Experiment I. The following instructions were given:

> 'I am going to tell you something which has happened, and you have to find out *how* it happened by asking me questions which I can answer either yes or no. If your question isn't clear, or I'm not sure how to answer it, I'll say "I can't answer", and you'll either have to rephrase your question or else ask a different one. If you ask a question which won't help you to get the answer, I'll say "It won't help". Again, you can ask as many questions as you need, but the aim is to get the answer in as few questions as possible. If you don't think you can get the answer, it's O.K. to give up after you've tried, but don't give up unless you really think you have to. Any questions before we begin?'

'The thing that happened was this: a man was driving along the road in a car: the car went off the road and hit a tree. How did this happen?'

After each subject has arrived at the solution or given up,; he was asked two questions:

1. Did you try to use any particular plan for getting the answer?
2. Which of these two questions do you think it would have been better to start off with? (a) Was there anything wrong with the man? or (b) Did the man have a heart attack? And why?

Finally, each subject was asked not to discuss the experiment with other boys. Again, the whole procedure was taped.

Treatment of Results. The correct answer was: 'There was ice on the road; he took a bend at twenty five mph, when he shouldn't have been doing more than fifteen ('too fast' was accepted), and he skidded. There were thus four elements: ice, bend, too fast and skid. If a subject guessed one of these, he was told that he had part of the answer. The following dependent variables were recorded:

1. The number of elements guessed.
2. The number of questions required.
3. Percentage constraint questions.
4. Incidence of narrowing.
5. The strategy (if any) reported in answer to question 1.
6. The reasons for choice in answer to question 2.

Owing to evidence of cheating, Q.1 and Q.2 could not sensibly be used in the results.

Results

Social Class. No Social Class differences occurred in the actual or reported use of 'constraint' questions or 'narrowing' strategies (see Table 7.4.3).

Table 7.4.3 Characteristics of Questions of Boys of Different Social Classes on One Trial of 'Find the Cause'

		Social Class		
		MC	UWC	LWC
Percentage of 'constraint' questions	$\overline{X}$	14.65	28.39	12.90
	sd	13.29	22.31	14.36
S's who used 'narrowing'		1	3	1
S's reporting 'constraining'		4	2	1
N		8	8	8

When asked to choose between the general (a) and specific (b) questions as first questions and to justify their choices eighteen of the twenty-four boys preferred generality of scope explicitly or implicitly, three UWC preferred but gave 'odd' reasons, while one boy from each group chose the more specific question.

Intelligence Test Scores. There was no substantive relationship between Raven's scores and any of the dependent variables, with exception of a weak trend for low scorers either to have inadequate reasons for preferring the more general of the offered questions or to choose the more specific question.

Comparison of Performance in the two Experiments

The variables on which results could be directly compared were percentage constraints and incidence of narrowing. The percentages of constraints across the two experiments correlated 0.51 ($p < .05$), while 'narrowing' was also associated (Fisher Exact Probability Test, $p < .05$) (4 S's narrowed in both, 14 in neither).

Discussion

Comparison of results in the two experiments suggests some degree of consistency in performance, a fact which is satisfying in view of the relatively subjective criteria used in classifying questions in the second experiment and the very wide individual differences obtained. There was no evidence for any social class-based differences in performance; not only were all differences non-significant, but also each of the three groups obtained the best score on at least one of the dependent variables. Intelligence test scores were found to have some relevance; subjects with higher Raven's scores tended to ask a broader opening question and were more likely to use narrowing constraints in the first investigation, and (although this result did not quite attain significance) appeared rather better at recognising a superior strategy in the second experiment, after not having employed one in the first place. However, these advantages were not sufficient to make the brighter subjects superior in performance overall.

The general impression obtained was that the subjects were not very good at 'Twenty Questions'. Comparing the results with those of Mosher and Hornsby, the level of performance overall here is closer to that of their eight year olds than that of their eleven year olds. Why is it that fourteen and fifteen year olds in the present study perform so badly? For example, they required a mean of 14.6 questions to guess one object in Experiment (i), and asked only forty three per cent and eighteen per cent constraint questions in Experiments (i) and (ii) respectively? One possible explanation lies in the fact that the Mosher and Hornsby materials were in colour and those used here were in black and white. Seventy per cent of the American eleven year olds used 'intrinsic perceptible' attributes in their constraint questions, and colour was probably prominent among these. Another line of explanation would cite a reluctance to stick to a strategy which, although more efficient, involves rather greater cognitive strain, and part by the frequently observed 'inability or unwillingness' to utilise negative information (Donaldson, 1959). The explanation of this phenomenon is problematical, and beyond the scope of this study, but it would appear that it might have been due to a negative reinforcing effect on the part of a 'No' response, which vitiated the formal information-value of the question; it frequently happened that a subject would begain a game in Experiment (i) by asking a number of constraint-questions, using some of the more obvious equivalent-classes; for instance, 'forms of transport' or 'animals'; if all these met with a 'No' answer, he would resort to a process of pure hypothesis-testing, often ignoring such information he should formally have gained by his previous constraint-seeking if he did not get the answer quickly. This could simply be a case of the extinction of a response, followed by frustration which serves to impair the level of cognitive functioning.

7.4.2 Interrogation Strategies and Social Class (F.M. Freeman)

With a selected sub-sample of girls taken from those children described in section 7 3.2, we played a variation on a theme by Mosher and Hornsby by switching from an artificial array to a set of photographs depicting two national costumes, historical events, famous people, popular people, and crops. We imagined that these would evoke more interest than guessing what an experimenter has in mind (see last section) and would approximate more closely to problems they might encounter in their normal activities. Although they would not normally find it necessary to interrogate someone whose replies were confined to 'Yes/No' answers, the questions actually asked would perhaps be indicative of the means they would adopt to solve the puzzle.

Category	*Set A*	*Set B*
1. National Costume	Girl from Bali	Japanese Archers
2. Historical Event	Napoleon leaving Moscow	The Crusades
3. Famous Person	Yuri Gagarin	General de Gaulle
4. Crop	Coconut Palm	Tobacco
5. Popular Person	John Peel (D.J.)	John Peel (D.J.)

Method

Materials. Two sets (A and B) of mounted 10 x 8" black and white photographs were used, each containing five pictures – Sets A and B were shown to alternate subjects. The five categories in each set, and the particular photographs used, were as follows:

As the aim of the task was to induce children to ask questions in order to solve a problem – that is to find out something about the photograph, the latter were chosen with a view to their unusual characteristics, in the hope that the subjects would not have seen them before, and therefore would not be able to guess immediately who or what the photograph represented. For example, photograph A3 showed Yuri Gagarin dressed in uniform, signing a document, rather than attired in a space suit standing next to a space ship on a launching pad. It was hoped that the corresponding pictures in the two sets were roughly equal in their difficulty, complexity, and photographic quality. In addition to the sets of photographs, there was a map of the world on the table before each subject, which they could consult or use if they wished.

Subjects. The subjects were the thirty girls mentioned in section 7.3.2 (see Table 7.4.4).

Table 7.4.4 Characteristics of Subjects

	Social Class	Mean Hall-Jones Category	Raven's Scores IQ Equivalents
Group A	Middle	3.1	116.6
Group B	Lower Working	6.2	116.3
Group C	Lower Working	6.1	94.8

Procedure. Subjects were interviewed individually in a small quiet room by the experimenter, for a period of approximately fifteen minutes each. Photographs of Sets A and B were given to alternate subjects in the same order (1–5) but they were first asked if they knew the subject of the photograph. If the answer was 'No', they were then requested to ask closed questions to try to find the answer. Subjects were given a map of the world to consult if necessary, the interview was recorded, and they were allowed three minutes for each topic. It was made clear that this was not a test and that only we would know what they had done. The specific instructions were as follows:

> 'I'd like you to look at several photographs. The first one is of somebody wearing their national costume. Do you know which country they (she) come(s) from? .... Well, what I want you to do, is to try and find out the answer from me, by asking questions. You can ask as many questions as you like, but I can only give you the answers 'Yes' or 'No'. There is a map for you to look at which might help you. Do you understand? Right, now what is the first question you'd like to ask?'

Instructions for the other topics were similar, after the substitution of the appropriate words – *e.g.* 'This is a photograph of a famous person ...', '... a crop' *etc.*. The only exception was the second topic, the historical event. Here, subjects were required to find out three things rather than one – the name of the person concerned, where the event took place, and the approximate date.

At the end of the interview the girls were told that we were not interested in how quickly they got the right answers, but only in the way they went about finding out. It was no kind of test, and they were asked not to describe materials or procedure to anyone else until everybody had been seen.

Treatment of Results. During the course of the interviews it became evident that the girls had not followed our request not to talk about the pictures with those not yet interviewed. The incidence of 'cheating' was very high, and our detective work showed that conservatively an average of nearly two 'answers' had been disclosed. We cut out all responses which indicated that answers were already known. These were indicated by immediate correct solutions and by such devious questions as 'Does his second name begin with a P?' and 'Is his first name John?'. (The only light relief came from the occasional confusion stemming from the two sets of pictures. A subject confronted with 'Napoleon retreating from Moscow', finding her speedy offer of 'General de Gaulle' rejected, had to jump some clever hoops to maintain that she had no prior knowledge of the materials.) Usable responses were reduced to means of 2.5 for Groups A, 3.7 for Group B and 3.3 for Group C – a cheating incidence of thirty seven per cent. Calculations were based on scores per photograph.

Questions and performance overall were categorised under five headings:

C (Constraint questions), N (Narrowing – any constraint question following upon a previous constraint), S (Specific hypotheses), I (Questions inappropriate to any plan, A (Correct answer achieved).

Results

Analysis of variance revealed no differences between Groups A, B and C in the percentage of Constraint or Narrowing questions. On the other hand Group A asked significantly more questions than either of the other groups ($p < .05$) and achieved a greater proportion of solutions than Group C ($p < .05$) (and marginally more than Group B ($p < .10$ (see Table 7.4.5).

Table 7.4.5 Incidence of Constraints, Narrowing, Correct Answers and Questions asked by Social Class and IQ

	Group		
	A MC High IQ	B LWC High IQ	C LWC Low IQ
% Constraint questions	52.3	46.2	43.0
% Constraints 'narrowing'	63.0	60.6	66.0
% Correct answers	37	30	13
Number of questions	10.8	8.1	8.5
N	10	10	10

Discussion

We cannot be smug about our success in the handling of this investigation. It is reported for two reasons, one substantive, the other technological. Although we cannot locate either IQ or social class as independent sources of variance on two measures, they operate in conjunction. Without a low IQ MC group, we cannot be sure that social class would not operate on its own.

Technologically, the problem to be raised is one of how to conduct successive interviews without subjects interacting in such a way as to destroy the investigation. First of all, the individual interviews were conducted in the proverbial 'friendly and relaxed atmosphere', and the girls were assured it was not a test. Too late? The school authorities were efficient in their arrangements for our activities. We had conducted timed testing with the Raven's Progressive Matrices and then selected girls on some unknown criterion for individual interviews. It is possible that the machine-like precision of the operation proved to be its own undoing. While it is of no direct relevance to the particular studies here the issue of how successive interviews can be conducted without interference is one that merits serious inquiry.

7.5 Questions in Problem Solving

There are a number of unnatural features in the 'Twenty Questions' games that may have been responsible for the far from ideal performance of the adolescents. Who wants to know which of forty two pictures some strange visitor has in mind? Who wants to know the answer to an open alternatives problem? If you enjoy pitting your wits against problems, if you enjoy working out and enacting clever strategies, then such tasks can have an attraction. The provision of photographs of real personages and products might have been expected to influence the motivational states of subjects, but there is scant evidence for this in the data.

Our final adventure into interrogation strategies sacrificed the previously exercised degree of control over the type of responses emitted in the interest of increasing the subjects' involvement. We selected three tasks each intended to be distant from the school environment, none of which required the guessing of arbitrarily contrived ideas in someone else's head. The significance of the experimenter as a person was attenuated both by having potentially more interesting tasks to perform and by having the subjects work in groups, while the experimenter faded into the role of observer.

The first task in which various pieces of cardboard could be arranged into a hollow square by working out the relevance of certain visible cues was the most academic of the three. The second task required the subjects to construct a model helicopter from an Airfix kit. The third task was to recall and re-construct the manner in which several goals came to be scored in the 1964 European Cup Final from watching a film of the match.

In order to complete each of these tasks a number of subsidiary problems must be solved. Although it may not be possible to specify 'ideal' strategies for any of these, some evaluative comments about particular strategies adopted can be made. One important requirement for successful solutions is to pose relevant questions, and it was in these that we were particularly interested. Would the children ask any questions in the course of their activities? Would they ask relevant questions in a sensible order? If we could have specified a 'unique' ideal strategy (or set of strategies) in advance, we might have chosen to describe the performance of the groups against such a framework. We chose rather to create contrasting groups as a basis for relative comparisons.

One complex variable used was the somewhat inevitable intelligence test scores. We might reasonably expect more intelligent children to be more successful at analysing, processing and synthesising the information in the tasks. In our earlier studies of the questioning behaviour of children of this age group, 'social class' has not operated as a strong discriminating variable, but intelligence test scores have had relevance. The incorporation of a division is not simply to demonstrate differences, but to indicate how potentially better performing subjects may realise the differences in task performance.

Anticipating that the children would not emerge as proficient problem-solvers, we considered it worthwhile to give some groups brief verbal instructions on how best to set about the tasks. If such perfunctory 'training' has significant effects two inferences may be warranted; children are not generally learning (or are not learning to apply) the problem-solving skills mentioned in section 7.1, and this deficiency might be rapidly remedied.

So that social factors should not be forgotten and hence to act as a reminder that in particular situations social considerations will be important, we decided to introduce one source of socially-based differences into the groups. Since we were interested in treating each individual as a subject in his own right, it would have been unwise to manipulate roles in the group by introducing special 'leaders' or something similar. In choosing to manipulate the sociometric rather than the normative structure of groups, we had in mind the practical consideration that teachers allocating children to groups for project work can decide to put 'friends' together or can deliberately avoid groups constructed on such a basis. We therefore made up groups of close friendship choices and unassociated boys.

With a small sample of subjects, it would not be wise to generalise from the results we obtain. The suggestions and observations generated in this paper, as a result of our observations of the way in which the subjects performed the tasks should be regarded primarily as a starting point from which thoughts and future work might be developed.

Bearing this in mind, it was expected that the higher IQ groups would perform differently to the lower IQ groups, in that they would talk more, ask more questions, be more efficient in noticing and making use of the concepts available for them in Task 1 (the puzzle), generate more suggestions, and be better able to organise themselves into a working team. It was also thought that the close friendship groups might be less productive than the non-friendship groups, because they would spend too much time in social exchanges and pleasantries (Back, 1951), and finally, it was expected that the 'trained' groups would perform the tasks and achieve scores more similar in nature to the high IQ groups than to their fellow low IQ groups who were untrained.

Method

Materials.

Tasks. The three tasks were chosen specifically because it was considered they would arouse the interest of our male subjects and would not appear to them to be closely related to academic work. Task 1 was to complete a geometrical shape (a hollow square) which was divided into four sectors. The sixteen pieces were marked with coloured stars – four silver stars, three red stars, three blue stars, three green stars and three yellow stars. In addition, pieces which formed the four outside corners of the completed square were marked with a black arc. One piece from each quarter was placed in an envelope for each subject, one of which in each case was a silver piece.

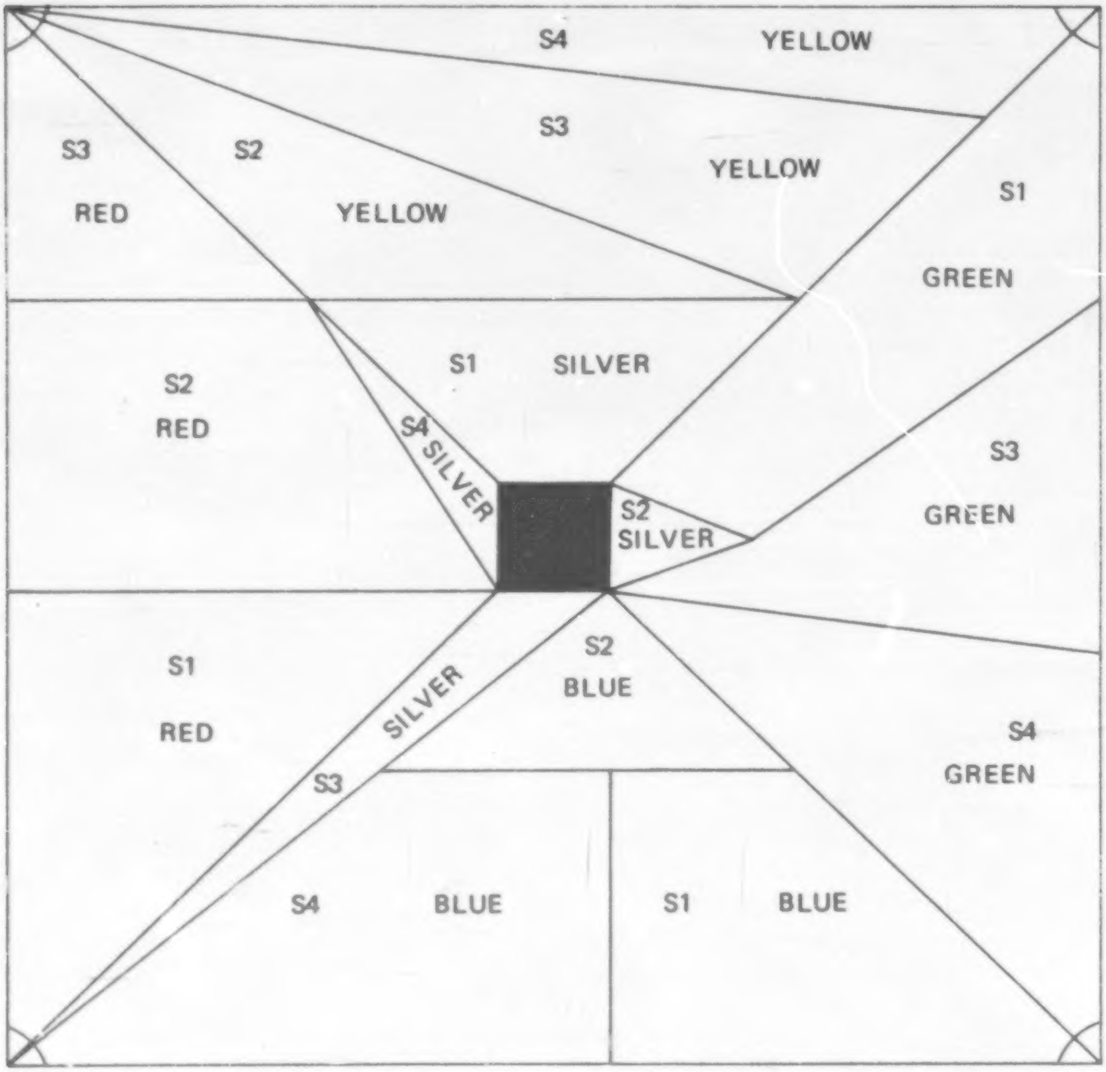
The completed shape, measured 14" x 14" and was made of thick white card.

The solution to the puzzle was that the four silver pieces formed the inside edge of the pattern (one in each quarter). Each quarter comprised the three pieces of the same colour – *e.g.* one quarter consisting of one silver piece and the three blue pieces, another quarter consisting of one silver piece and the three red pieces *etc.*. The first ten minutes of the task had to be spent by the subjects in a discussion of how they could solve the problem without actually attempting to do so. A further five minutes was then allowed for them to put any ideas they had generated into practice. All conversation was tape recorded and two observers were present throughout, making notes to aid in the transcribing of the tapes, to note, as far as was possible who was spoken to, and by whom, and to record any specific social interaction, for example, a display of verbal or physical aggression by or against one of the subjects.

In Task 2 the groups had to construct an Airfix model of a Westland helicopter. They were given fifteen minutes to do this, and again, all conversation was recorded, and the observers made notes.

Task 3 consisted of a piece of film taken from a European cup final match between Eintracht and Real Madrid, which had been kindly loaned to us by Southampton Football Club. The selected piece of film lasted approximately ten minutes and during this time three goals were scored. Each group saw the film sequence once, then on a second run through, the film was stopped three times, shortly before each goal was scored. The groups

Fig. 7.5.1 Structure of the Hollow Square : Task 1


S4
YELLOW
S3
YELLOW
S3
RED
S2
YELLOW
S1
GREEN
S1
SILVER
S2
RED
S4
SILVER
S3
GREEN
S2
SILVER
S1
RED
S2
BLUE
SILVER
S3
S4
GREEN
S4
BLUE
S1
BLUE

had to come to a decision among themselves as to what action followed, and which moves led up to the scoring of the goals. Again the task was tape recorded, and the observers made notes.

The three tasks were completed consecutively by each group in the same order as above, and before and after finishing the tasks the groups were requested to fill in questionnaires (Questionnaires 2 and 3) which it was hoped would give us additional information and possibly clarification of the interaction which had taken place, and also indicate whether opinions had changed during the course of the group. The entire proceedings took approximately one hour per group, the six groups following each other over a period of two days, the two 'trained' groups being the last two.

Questionnaires. The format of the three questionnaires used is set out below.

Questionnaire 1

Name:........................ Age: .... Form/Set: ....

If you had the opportunity to choose three classmates with whom to work in a small group, which *three* would you like to choose?

1. ....
2. ....
3. ....

You have chosen three people to work with. Here you should write the names of your three best friends in the class. The names can be the same or different.

1. ....
2. ....
3. ....

Questionnaire 2

NAME:.......................... *GROUP NO.:* ....

Write down the name of the person in your group whom you think will

1. Do the most practical work. *Name:* ....
2. Ask the most questions. *Name:* ....
3. Have most of the best ideas. *Name:* ....
4. Try to organize the group. *Name:* ....
5. Be the most friendly. *Name:* ....

Questionnaire 3

NAME:.......................... *GROUP NO.:* ....

A. Write down the name of the person in your group whom you think
   1. Did the most practical work. *Name:* ....
   2. Asked the most questions. *Name:* ....
   3. Had most of the best ideas. *Name:* ....
   4. Tried to organize the group. *Name:* ....
   5. Was the most friendly. *Name:* ....

B. Which *one* member of your group would you choose to work with on a group project in future?
   Name: ....

C. Would you rather do tasks like this

1. On your own.
2. With your best friend.
3. With a group like this.

Put a tick against *one* of the three.

Subjects. A large, predominently working class boys' comprehensive school was selected for this series of experiments. The original population consisted of the entire third year of the school, which was divided into six sets, some 130 boys in all, the average age of whom was 13.5. As we intended to use intelligence test scores as a variable, the school was visited some weeks prior to the main experiment, and the Raven's Progressive Matrices were administered to all 130 boys. IQ equivalents were then calculated. For matching, tolerance limits of approximately four points on either side were allowed. In addition to completing the Raven's Matrices, all the boys were requested to fill out a questionnaire (Questionnaire 1). The purpose of this was to obtain information upon which we could base our choice of 'friendship' groups and 'non-friendship' groups.

On the basis of this information gathered on the first visit to the school, it was possible to select six groups of four subjects (one group from each of the six sets) all of whom were aged fourteen:

Group A consisted of a 'non-friendship' group of four high IQ boys.
Group B consisted of a 'friendship' group of high IQ boys.
Group C consisted of a 'non-friendship' group of low IQ boys.
Group D consisted of a 'friendship' group of low IQ boys.
Group P consisted of a 'friendship' group of low IQ boys who were 'trained'.
Group Q consisted of a 'non-friendship' group of low IQ boys who were 'trained'.

For the purpose of making a distinction in terms of IQ, the High IQ group were those subjects who obtained an IQ equivalent score on the Raven's Matrices of over 100. The average IQ score for the eight boys in the two High IQ groups was 112.5. Low IQ groups consisted of subjects with an IQ equivalent score of less than 100. The average IQ score for the sixteen boys in the Low IQ groups was 94.6.

In order to differentiate between 'friendship' groups and 'non-friendship' groups the data from Questionnaire 1 were analysed. Each boy obtained two scores: the number of fellow classmates who had chosen him as a work partner, and the number who had rated him as a friend. Further scores were then calculated as to how many of these preferences were reciprocated. 'Friendship' groups therefore consisted of boys who rated high on the friendship scale of Questionnaire 1, but who also obtained high scores on the work category, and whose choices were reciprocated. Thus, for instance in Group P (Low IQ/Friendship Group/Trained), out of the twenty four possible choices made by the four subjects – each subject choosing three friends, and three people to work with – twenty one of these choices were for members of the group. Duly, two other boys in the class were chosen by Group P (one of them being chosen twice). It was considered necessary for subjects to be reasonably popular as workmates, as well as friends, in order to qualify for membership of a 'friendship' group, in case their popularity as friends was dependent upon something which might not be conducive to efficient problem solving. For example, several of the boys in the original sample obtained quite high scores on the friendship category, but few people wished to work with them. This could have been because they were regarded as not being very intelligent or perhaps because their popularity was based to some extent on their destructive attitude in class, bringing light relief to their classmates by fooling around behind the teachers' back, *etc.*

'Non-friendship' groups were again composed of subjects who scored highly on the work category and obtained high scores as friends. The main difference here was that none of the choices were reciprocated. That is, a popular member from one section of the class was picked to work with similar boys from other sections. For example, in one of the groups, one subject was rated as a friend by six people, and seven people wished to work with him, but none of these choices were made by subjects eventually chosen to work with him in the group experiment who themselves had obtained similar scores.

Instructions and Procedure. It was considered advisable to run a pilot study of Task 1 (the puzzle) before using it in the final experiment. This was because it had been designed by the experimenter and had never been used by children before, and we had no idea how long children might take to complete it.

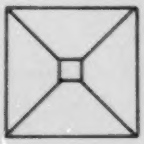
A group of four high IQ fourteen year old girls were used for the pilot experiment. They were allowed ten minutes to discuss how they would solve the problem, and then given unlimited time to put their ideas into practice. They in fact completed the square in twenty seven minutes.

Although the time allowed for discussion (ten minutes) remained the same in the final experiment as in the pilot study, the time allowed for the completion of the pattern was cut to five minutes. This was for two reasons, the first being that much of the latter conversation of the pilot group was concerned with the mechanics of the task, that is the actual fitting together of the pieces, once they had got hold of all the concepts of the task and realised the solution, after completing one quarter of the square. The second, and possibly more important reason was that we did not want the subjects in the final experiment to find it easy to complete the pattern within the time limit. We were essentially interested in the way they attacked the problem, the use they made of the concepts, and the ideas they generated for its solution, although it would of course have been interesting to let each group complete the pattern if they could, and compare their time with different variables. For the general purposes of this study, we decided to forego the possibility of obtaining statistical differences in the performance of the groups in favour of a detailed description of how these children actually tackled the problem.

When the subjects in the main experiment entered the room where the tasks had to be performed, they were asked to sit down at a table where places were numbered from 1 to 4, but were told they could choose their own seat. (The numbers were to aid the observers when making notes of the proceedings.) The experimenter chatted to them for several moments, asking their names, explaining the use of the tape recorder and generally trying to put subjects at their ease. Subjects were then asked to complete Questionnaire 2. The experimenter indicated the paper and pens on the table, and informed the subjects that they could use these if they wished.

Task 1 was then begun, and the four 'untrained' groups were given the following specific instructions:

> 'I want you all to listen carefully while I explain what you have to do. In front of each of you is an envelope, which contains four pieces of cardboard, therefore between you, you have sixteen pieces. When all these pieces are fitted together, like a jigsaw puzzle, they make a square like this.



You can see that there is a square hole in the middle of the pattern. You can also see that the square is divided into four parts — each part contains four of the pieces from your envelopes. Do you understand so far?

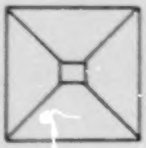
I want you to work as a team, and spend the first ten minutes talking with each other, and deciding which is the best way to complete the pattern.
But You must keep all your pieces in front of you all the time.
You can touch your own pieces, but you must not touch, or exchange pieces with other members of your team.
You must not start trying to make the square yet.
You must not mark any of the pieces.
Right, you will all please open your packets now, and spread the pieces out on the table in front of you, with the side with the stars on top. The numbers on the back are not important — it is just your own number, S1, S2, S3 or S4.
Now you have ten minutes to talk among yourselves and plan what you are going to do.'

After ten minutes, the remainder of the instructions were given:

'Right, your ten minutes is up. Now will you try to make the pattern, working as a team.'

The two *'trained'* groups were given the following instructions:

'I want you all to listen carefully while I explain what you have to do. In front of each of you is an envelope, which contains four pieces of cardboard, therefore between you, you have sixteen pieces. When all these pieces are fitted together, like a jigsaw puzzle, they make a square like this.



'You can see that there is a square hole in the middle of the pattern. You can also see that the square is divided into four parts — each part contains four of the small pieces from your envelopes. Do you understand so far?

Now let's go over that again. How many pieces have each of you got?
How many does that make altogether? Right.
Now how many parts are there to this square?
And how many small pieces does it take to make up the whole square?
Right — sixteen pieces to make the whole square, and you have sixteen pieces between you.

Now will you all please open your packets, and spread the pieces out on the table in front of you, with the side with the stars on top. The numbers on the back are not important — it is just your own numbers, S1, S2, S3 or S4.

Now for the moment I want you to keep all your pieces in front of you. You can touch your own pieces, but you must not touch, or exchange pieces with other members in your team.

Don't start trying to make the square yet, and don't mark any of the pieces. Have you all done that?

Right — now look at your own pieces carefully.
It is possible that each of you have the four pieces that go to make up one part of the square — for example, you have all the pieces for this

part (pointing), you for this part (pointing) *etc.*
But that would be very easy, wouldn't it.
Do you think it's likely to be like that? Well then, how else could the pieces be divided? So that then is the first thing you have to try and find out.

The next thing I want you to do is to look at all the pieces again. What can you see on each piece? That's right, a star.
But they're not all the same, are they? How are they different?
That's right, they are in different colours. How many colours are there altogether? That's right – five-red, blue, green, yellow and silver. It's possible therefore, that the colour of the star is an important clue in solving the puzzle – otherwise, there would be no point in having stars there, would there?
So that is the second thing you must remember when doing this puzzle – what is the importance of the colours.

There is something else important about the colours.
Look at all the pieces carefully – can anybody tell me what it is?
(Clue about numbers if subjects unable to answer)
Yes, that's right, there are not the same number of colours are there?
There are four silver stars, but only three of all the other colours.
It is possible therefore that there is something special about the silver pieces – why are there four rather than three like the others?
Look carefully at the pattern you have to make – can you see four of anything there?

So that is the third important clue you have – why are there four silver stars and only three of all the others?

There is one more important clue, can anybody tell me what it is?
(If subjects unable to answer – Well what else apart from the stars can you see on some of the pieces?)
That's right, some of the pieces have black semi-circles on them – therefore it is possible that this is another important clue when making the puzzle.

Does anybody have any idea why the semi-circles might be important?
Well, that's the last clue for you to remember.

Now then, let's go through the important points once more.
Can anybody remember what they are?

1st – How are the sixteen pieces divided up between the four of you?

2nd – The importance of the different colours.

3rd – The importance of the different numbers of colours – four silver and three of all the others.

4th – The importance of semi-circles on some of the pieces.

Now I want you to work as a team, and spend the first ten minutes talking with each other, and deciding which is the best way to complete the pattern.

You must still keep all your own pieces in front of you, and not touch or exchange pieces with any of the other members of your team.

Now don't forget the points we've mentioned, and start making your plan of what you are going to do now.'

After ten minutes, the remainder of the following instruction was given:

'Right, your ten minutes is up. Now will you try to make the pattern, working as a team.'

After completing Task 1, whilst the table was being cleared to prepare for the next task, subjects were encouraged to talk, again in an effort to make the proceedings appear friendly and relaxed. Task 2 was then begun, and the 'untrained' groups were given the following instructions:

> 'I want you all to listen carefully while I explain what you have to do. This is a model of a Westland Helicopter, and here is some glue. I want the four of you to work as a team, and make as much of this as you can in fifteen minutes. The instructions are on the package. Everybody understand what to do? O.K. Will you start now please. You have fifteen minutes.

The 'trained' groups were given the following instructions:

> 'I want you all to listen carefully while I explain what you have to do.
>
> This is a model of a Westland helicopter, and here is some glue. The instructions are on the inside of the packet. The idea is for the four of you to work as a team, and make as much of this as you can in fifteen minutes.
>
> There are different jobs that need doing. Some of you may be better at some than others. For instance –
>
> reading and following the instructions
> making out the order in which to do things
> putting together the fiddly little bits
> laying out bits before assembling.
>
> So you should decide first what jobs need doing, who should do which and perhaps who should be in charge.
>
> Right, does everybody understand what to do – O.K. start now please. You have fifteen minutes.'

When the time limit had been reached, all groups were told the following:

> 'O.K. Your time is up now.
> Now there's only one model, but perhaps one of you would like it.
> Could you decide among yourselves now who is to have it.'

Subjects were then allowed to make their decision about who should keep the model and talking was again encouraged whilst the table was cleared and the seating arrangements changed in preparation for Task 3. Task 3 was then begun, and the 'untrained' groups were given the following instructions:

> 'We're going to show you a small piece of film of a European Cup football match. I want you all to watch it carefully. After you've seen it once we're going to run it through again, but this time, we will stop the film in three places, before the goals.
>
> After each break, you will have a few minutes to work out between yourselves just how the next goal is scored.
>
> Does everybody understand? Right, this is the piece of film. Watch it carefully.'

The 'trained' groups were given the following instructions:

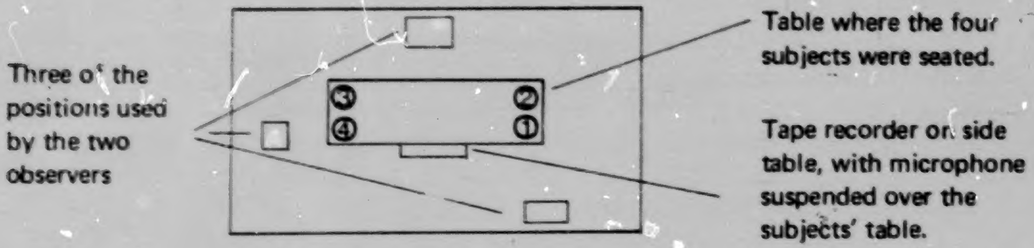
> 'We're going to show you a small piece of film of a football match. It's one of the European Cup matches. I want you all to watch it very carefully. After you've seen it once, we're going to run it through again, but this time, we will stop the film three times.

> Each time we will stop the film shortly before a goal is scored, and each time the film is stopped, you will have a few minutes to work out between yourselves just how the next goal is scored.
>
> Now I'll give you a chance to work out the best way of organizing yourselves to do as well as possible.
>
> For example, it may be a good idea to divide up jobs. You might have one person in charge. Someone with a good memory might try to remember as much as possible of what happened before the goal. Or you might decide to each watch one side, or special players. It's up to you how you do this. O.K.
>
> We'll see the film through now, and you can organize yourselves as you think best. Now watch carefully.'

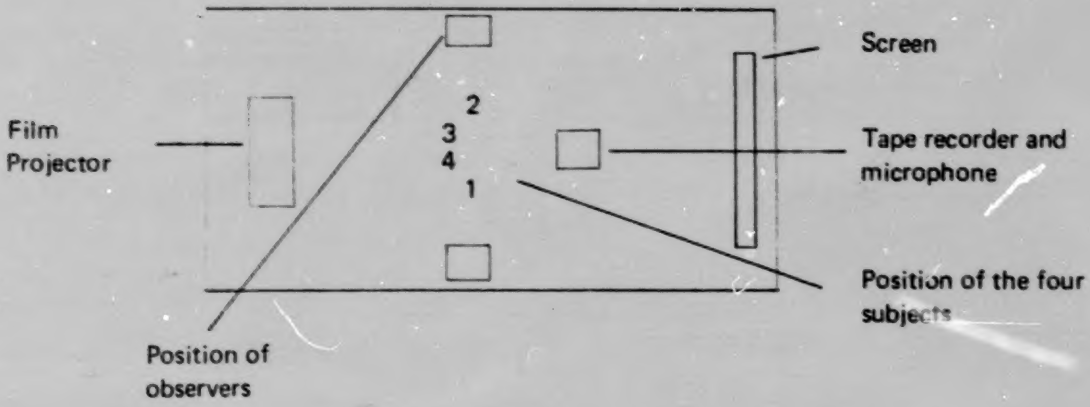
After the three tasks had been completed, subjects were asked to complete Questionnaire 3, and were then allowed to return to their classrooms, and asked not to mention what they had done for two days, that is, until all groups had been observed.

The groups were seen individually in one of the school's geography rooms, which had black-out facilities, during what would have been lesson time. The teachers were absent throughout all the proceedings, and, as has been said, a special effort was made to induce a relaxed, friendly atmosphere.

The seating arrangements for all groups in Tasks 1 and 2 were as below.


Three of the positions used by the two observers
③
②
④
①
Table where the four subjects were seated.
Tape recorder on side table, with microphone suspended over the subjects' table.

In Task 3, the seating arrangements for all groups is shown below.


Screen
Film Projector
2
3
4
1
Tape recorder and microphone
Position of the four subjects
Position of observers

Treatment of Results. As has already been mentioned, it was decided not to perform any statistical analyses on the data we obtained from this experiment, but to concentrate on a detailed description of what happened with in the groups.

It was found to be advisable to drop Group Q. (Low IQ/'non-friendship' group/ trained) from the analysis. One of the subjects from this group was taken ill, as was also the first choice of substitute. The subject who was eventually chosen as a replacement proved to have a very disruptive influence upon the group. Little was said by this group, and the little there was appeared to be mainly of an aggressive nature. This group made hardly any effort either to listen to the instructions or to attempt the tasks, and the entire procedure took on the characteristics of a slanging match. This group will not therefore be referred to further. The tape recordings of the five other groups were transcribed, sided by the notes taken by observers.

1. The first stage was to calculate the total number of utterances made by each group for each of the three tasks. This was merely a straight count of everything which was said by every subject.
2. A coding frame was devised to show up distinctions not made in more generally available schemes, *e.g.* Bales' Interaction Process Analysis (1950). Since the distinctions did not emerge, the categories were transposed into the Bales' system. This distinguishes twelve categories (see Fig. 7.5.2.).

The only coding difficulty of some import was what to do with tag questions *e.g.* 'Let's put all the small ones together, shall we?' or 'The stars might make a pattern, mightn't they?'. These were treated as proposals, opinions or statements of fact rather than their interrogative complementaries on the grounds that such utterances were treated as propositions rather than as questions by both speakers and listeners.

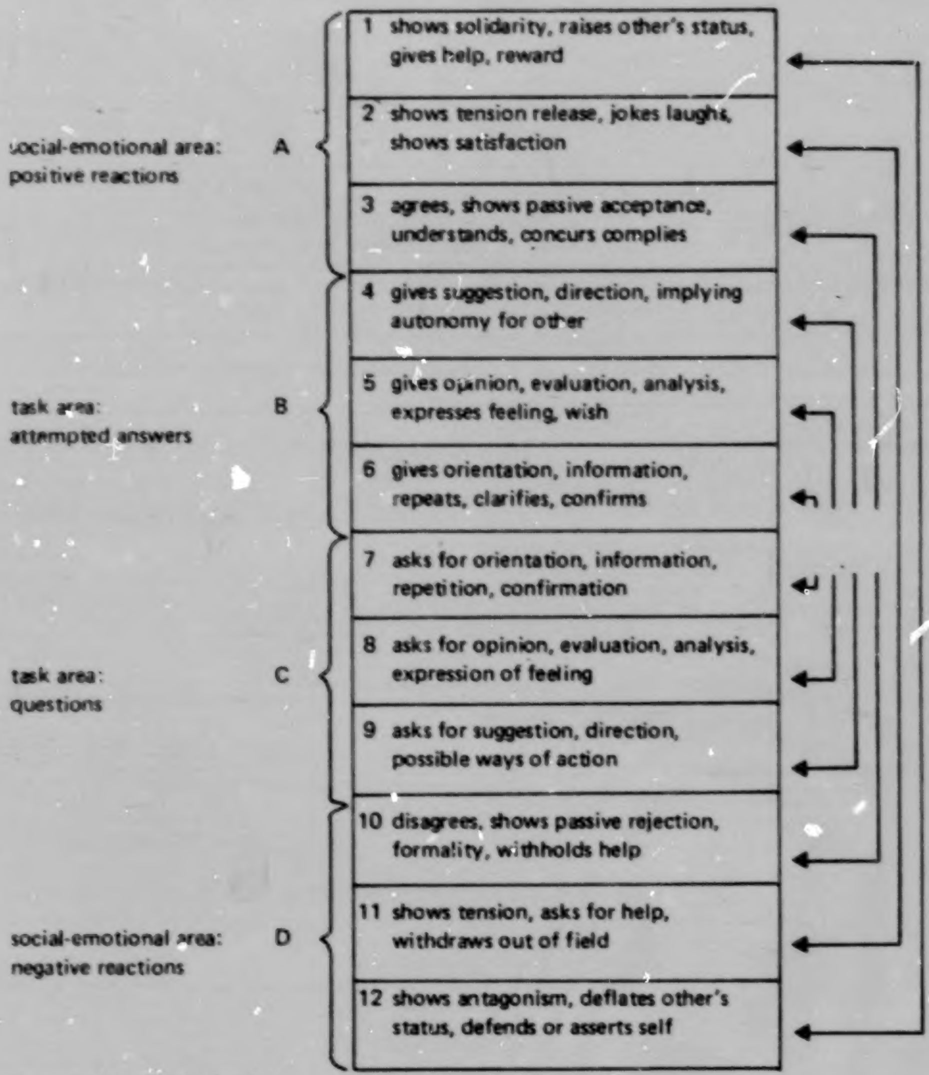
Results and Discussion

Task 3 Film. While we were rather pleased with this idea in that we thought the content would be interesting to the boys, goal-scoring as a sequence of moves was simpler than had been envisaged. In so far as it is possible to distinguish between general kicking about and attacking moves culminating in shots, these attacking moves did not have the build-up of ten or so units originally imagined. 'He got a break on the inside, dashed forward and belted into the top left hand corner' seemed to be a perfectly reasonable account and the boys could generally remember very well what had happened without disagreement or debate. In short, there were no 'problems' to be discussed, and so Task 3 was dropped.

Social Emotional Area of Interaction. Data in Tables 7.5.1. and 7.5.2. can be processed to show that 1.8 per cent of remarks fell into the positive socio-emotional categories and 1.2. per cent fell into the negative ones. These compared with averages of 9.4 per cent and 3.4 per cent reported by Bales (1961) for Harvard freshmen groups. All we can say is that our groups were task-oriented rather than person- or group-oriented; they were sufficiently immersed in activity not to produce such responses?

Friendship and non-friendship groups. Socio-emotional responses were so rare as to preclude differences between groups. What activity in these areas there was showed no sign of a differential distribution. There is no evidence that High Cohesive groups differed from Low Cohesive groups or any other categories either, so that although the manipulation was operationally successful, it was of no relevance to performance.

Figure 7.5.2. Categories of Bale's Interaction Process Analysis



social-emotional area: positive reactions A

1 shows solidarity, raises other's status, gives help, reward

2 shows tension release, jokes laughs, shows satisfaction

3 agrees, shows passive acceptance, understands, concurs complies

task area: attempted answers B

4 gives suggestion, direction, implying autonomy for other

5 gives opinion, evaluation, analysis, expresses feeling, wish

6 gives orientation, information, repeats, clarifies, confirms

task area: questions C

7 asks for orientation, information, repetition, confirmation

8 asks for opinion, evaluation, analysis, expression of feeling

9 asks for suggestion, direction, possible ways of action

social-emotional area: negative reactions D

10 disagrees, shows passive rejection, formality, withholds help

11 shows tension, asks for help, withdraws out of field

12 shows antagonism, deflates other's status, defends or asserts self

a problems of orientation
b problems of evaluation
c problems of control
d problems of decision
e problems of tension management
f problems of integration

Table 7.5.1. Distribution of Categories of Verbal Activity in Puzzle-Solving for Five Groups of Boys

(* High Coh = High Cohesiveness = Group made up of mutual preferences)

		Group				
		Untrained High IQ		Untrained Low IQ		Trained Low IQ
Bales Category		Low Coh	High Coh*	Low Coh	High Coh	Low Coh
1 & 2	Shows solidarity/tension release	7	1	3	3	4
3	Shows agreement	34	23	30	27	39
	(i) simple	28	11	17	17	11
	(ii) with repetition of idea	6	12	13	10	28
4	Gives suggestion for action	7	26	15	27	26
5	Gives opinion	31	22	22	31	30
	(i) simple	17	8	14	22	17
	(ii) with reason	14	14	8	9	13
6	Gives fact	59	49	36	36	48
	(i) re nature of materials	34	27	13	27	28
	(ii) re actions done	4	1	3	3	1
	(iii) re possible solutions	21	21	20	8	19
7	Asks for information	44	22	27	9	30
8	Asks for opinion	9	7	4	1	9
9	Asks for suggestion	7	3	2	0	3
10	Disagrees (offers alternative)	18	14	14	10	12
11 & 12	Shows tension/antagonism	4	2	2	1	2
	TOTAL	220	169	155	147	203
Miscellaneous comments irrelevant to above, *e.g.* about task		13	3	5	6	14

Table 7.5.2. Distribution of Categories of Verbal Activity in Model-Building for Five Groups of Boys.

		Group				
		Untrained High IQ		Untrained Low IQ		Trained Low IQ
Bales Category		Low Coh	High Coh*	Low Coh	High Coh	Low Coh
1 & 2	Shows solidarity/tension release	9	11	0	0	2
3	Shows agreement	50	18	36	19	20
	(i) simple	34	12	26	11	15
	(ii) with repeat of idea	16	6	10	8	5
4	Gives suggestions for action	54	59	28	63	57
5	Gives opinion	33	16	18	17	15
	(i) simple	22	7	12	9	16
	(ii) with reason	11	9	6	8	9
6	Gives fact	92	95	52	55	75
	(i) re : nature of materials	39	22	13	18	29
	(ii). re : actions done	20	37	9	14	13
	(iii) re : possible solutions	33	36	30	23	33
7	Asks for information	57	38	29	29	28
8	Asks for opinion	10	4	3	3	9
9	Asks for suggestion	2	8	1	2	6
10	Disagrees (offers alternative)	16	6	8	8	8
11 & 12	Show antagonism/tension	8	2	1	1	3
	TOTAL	331	257	176	197	233
Miscellaneous comments irrelevant to categories		38	10	8	22	14

* Low Coh = Low Cohesiveness = Group made up with very few mutual preferences

With these three topics eliminated, we can ask about the similarities of these groups to other problem-solving groups, about their approaches to the particular tasks in hand and the relationship of intelligence test scores and training to these approaches. Using Bale's results (1958) on ninety six sessions of twenty four groups as a yardstick for comparison, we have already noted the lesser incidence of socio-emotional responses in our groups. Proportions of agreement (3 : 14.7% versus 16.5%) and disagreement (10:5.7% versus 5.6%) are virtually identical although our groups gave more suggestions for action (4 : 17% versus 8%), mainly because the model-building involved actions rather than discussion (3 : task 2, 22.3%; task 1, 9.3%). Questions made up a higher percentage in our groups than Bale's (19.0% versus 7%) mainly through the higher proportion of requests for information (6 : 14.8% versus 3.5%).

Hence, on a purely quantitative analysis, we might conclude that the WC boys are more task centred than the Harvard freshmen and that there is no deficiency in question-asking, but rather an abundance on interrogatives. But are the groups of boys efficient? This is best discussed for the tasks separately.

Puzzle-Task. We may choose to ignore the possibility that this activity would have been suitable for long-haired intellectuals rather than ordinary adolescents on the grounds that all members of the groups appeared to understand and accept the problem and worked cheerfully with the intention of meeting the challenge the puzzle presented. Skills were less impressive than motivation. Individual clues were accumulated gradually rather than quickly. All groups recognised the probable relevance of colour and arcs, several Groups used size and shape. They generally focused on constructing corners and edges, rather than quadrants or the whole square. The clues once noted were neither analysed nor evaluated systematically. Not all groups counted the number of pieces of each colour; those that did, counted inaccurately. The most common error was to 'find' four instead of three pieces of red, yellow, green and blue, but one group counted only three instead of four silver pieces, which error dogged their subsequent endeavours. Hence, although necessary clues were observed, their potential utility was negated by failing to count them or counting them incorrectly.

There was no shortage of hypotheses relevant to partial solutions: 'All the yellows might go together', 'One of each colour in each section', 'Perhaps all the circles (arcs) form a circle in the middle'. The first of these is sensible and correct, the second sensible and incorrect, the third can be quickly seen to be impossible, for although the arcs summed to a circle, the square was to be hollow at the centre. One group clung to this hypothesis throughout. Hypotheses were not in fact evaluated often or systemmatically. A proffered guess would be followed typically by a short inconclusive hopping exchange that would eventually hop to another clue. That is, there was little testing of the utility of ideas. Sequences like 'Perhaps all the silvers make section, all the yellows etc., Ah! No! The silvers are too small.' were rare. Paradoxically, some false hypotheses stayed with groups throughout the session. The most common was the notion that the arcs formed a circle somewhere. Another apparent handicap was the concern to find out how corners were made up. Groups were much less likely to focus upon the construction of quadrants or the inner perimeter. Although two groups noticed the smallness of the silver pieces and went on to infer that they might go in the middle, they did not observe that each silver triangle had one side of the same length. But these particular obstacles are small fry compared with the general failure to test hypotheses and build them up into a structured system.

One additional observation might be made. After the first ten minutes, the boys were allowed to build the square. It seemed to be the case that once actions were permitted, previous observations and hypotheses could be forgotten. Groups hurriedly juxtaposed pieces in a flurry of unco-ordinated pairings. Time ran out with almost no achievement in the two low IQ untrained groups.

Model-building. Only one group did not read out the instructions; sections were read silently or aloud. (They were not included in the analysis.) One group completed the model. The boys were more impressive on this task. Leaders emerged, a division of labour was achieved along different lines, *e.g.* getting bits into position versus stikcing, fuselage builders versus blade builders, and this division was sinsible in fact and considerately arranged. Although there was a much heavier non-verbal component in this task than in the Puzzle, the amount of talk was thirty four per cent greater. The high IQ groups showed a fifty one per cent difference, the low IQ groups only twenty one per cent.

Comment. The differences between the two tasks is interesting. Judging from the conversations, model-building was an activity familiar to the boys, and they were able to organise themselves effectively. The Puzzle was presumably less familiar, and they were less proficient. The ineffectual behaviour was reminiscent of the inefficiency noted in 'Twenty Questions' (see section 7.4). In both there was a failure to proceed systematically. In both 'Twenty Questions' and the Puzzle there was a rush into specific hypotheses, improbable as answers. In the Puzzle the failure to go beyond noting a possible clue on to counting instances of each and setting out the total array of information ensured defeat.

Intelligence Test Scores and Training. While cohesiveness was not relevant to verbal activity, intelligence test scores appear to have been. High IQ groups talked more than the Low IQ groups (29% more on Task 1, 58% more on Task 2). For particular categories there were not consistent differences, fifteen per cent fewer questions in the low IQ groups being of unknown significance. It is noteworthy that in the Puzzle task, the two High IQ groups were more likely to justify any opinion offered than were low IQ gorups (45% & 64% versus 36% and 29%).

In all three respects mentioned, the Low IQ group that was given a little training behaved more like the High IQ than the other Low IQ groups: total speech, proportion of questions, proportion of total opinions supported by reasons (see Table 7.5.3.).

Table 7.5.3. Comparison of Trained Low IQ Group and High and Low IQ Groups on Three Indices of Verbal Activity

	High IQ Untrained	Low IQ Untrained	Low IQ Trained
Mean number of units per group per task	289	169	278
Questions as a proportion of all coded verbal activity	19.1	16.3	19.6
Opinions with justifications as a proportion of all opinions on Task 1	54.4	32.7	43.3

While we developed no scoring system measuring degree of solution, both High IQ groups and the Trained Low IQ group looked to be nearer completion than the other two on the Puzzle and the Helicopter.

7.6 OVERVIEW

Points of Procedure. Our first surprise in this series of investigations was the incidence of cheating. With secondary school adolescents from both girls and boys of two different schools, we found that considerable cheating occurred. In interviews with younger children (see sections 7.1 and 7.2) this problem did not arise. The pupils who had cheated were quite content to lie about their extra-curricular use of interrogation strategies. They did not seem to be overly concerned to do well in the 'test'. They were not hostile and unco-operative, although they were somewhat more detached than the younger children. Our experience would make us very chary of conducting any further investigations with secondary school pupils where cheating could occur but remain undetected.

One precaution that might help would be to use tasks that 'sell' themselves to the pupils or tasks that can be sold. The Puzzle task and Model-building (section 7.5), although they were respectively intellectual and under-age, caught the interest of the boys sufficiently to eliminate our worries about experimenter and situation effects – and perhaps cheating. The 'Twenty Questions' did not have this attribute even though we switched from guessing ideas in the experimenter's mind to guessing who or what was in certain photographs. These might have been expected to arouse some interest, but we had no independent evidence that they did. To investigate competence in the use of strategies of interrogation more thoroughly would require pre-testing that children wanted to know the answer to the problem posed. The parlour game of 'Murder' or some innovation such as 'Find the Spy' might reveal a greater competence than we were able to uncover.

Methodology. Our results in this chapter and chapter 5 suggest that although social class operates as a successful and independent discriminative index in infant and middle school children, its force attenuates in secondary schools. One explanation for this has already been offered, namely that the IQ's of MC and WC diverge with increasing age so that it becomes difficult to make class comparisons with matched IQ's. This difficulty is accentuated by the operation of factors that help to keep secondary schools socially homogeneous, such as MC parents moving their 'duller' children into private schools or LEA's using areas of residence as the criterion for a neighbourhood comprehensive scheme where these areas cover homogeneous districts. The difficulty becomes methodologically worrying when we realise we are contrasting two groups who are deviant from their social class IQ norm. In two investigations we had to use mean IQ scores of 115 (7.1) and 116 (7.3.2 and 7.4.2) to achieve our matching. Only sixteen per cent of the population make scores as high as this. Hence our reluctant but necessary switch to an investigation of problems within the working class (see section 7.5 and chapters 3, 8 and 9).

Substance of Results. With the younger children we were able to show up social differences in questioning. At seven and a half and ten class differences in morphology were insignificant. However at the younger age fewer WC children appeared to be able to form questions and when they did these were simpler, stereotyped, and focused on perceptual attributes. WC children of ten were more likely to misquestion and underquestion and they did not ask as many questions, especially about the middle of a more 'difficult' prose passage. At the level of the single question-answer exchange, there is a WC deficit in performance.

While it might be asserted that this is misleading and is a function of misunderstandings about the tasks, unwillingness to enter into the game as constructed by a MC interviewer or the uninspiring quality of the materials provided, there is no evidence to favour such interpretations at the expense of the suggestion that they are simply less proficient in these skills.

While our class comparisons gave no differences on the variants of 'Twenty Questions', we might observe here a general inefficiency in the use of questions. At fourteen, children should be cognitively competent to build up economical sequences of questions to narrow down upon a critical item. As adults they will need to do so whether they be car-mechanics or body-mechanics, detective-inspectors or burglars, applicants for rent-rebates or National Trust maintenance grants. It is particularly unfortunate that a skill of such general use to human beings is not more systematically fostered.

That it might be relatively easy to educate children in such strategies was shown in the somewhat wider context of puzzle solving and model-building. In these tasks, a few hints to an untrained group were sufficient to attenuate the naturally-occurring differences expressed as twelve points of IQ. The incidence of question-asking was one index that appeared to increase as a result of instructional advice. As with the 'Twenty Questions' so with the problem-solving. The boys were generally inefficient in the puzzle task. That they were less inefficient in the model-building could be attributed to the heavier constructional component in this, but it could be that the boys had simply more experience in this activity, experience from which they had learned. Why is problem-solving not taught explicitly? One reason will be that it is subject-independent. At university level it is however common practice to run general and specific methodology courses in conjunction with content courses and there is no obvious reason why similar skills should not be encouraged within the study of English Literature, carpentry or geography. At the beginning of this chapter, we argued for the complementarity of knowing how to find out and knowing how and knowing that. What should be a balance ought not to be an antagonism. Someone with a mass of knowledge which cannot be sensibly deployed to solve current problems or which cannot be used as a foundation for acquiring more is a no better educated a person than someone who knows how to find out but has no prior knowledge to act as a basis for inquiry. Our evidence is consistent with the view that the education system is in no danger of committing this second error.

7.7 References

Back, K. Influence through social communication. *J. abnorm. soc. Psychol.*, 1951, *46*, 9–23.

Bales, R.F. *Interaction process analysis*. Cambridge, Mass.: Addison-Wesley, 1950.

Bales, R.F. Task roles and social roles in problem-solving groups. In E.E. Maccoby, T.M. Newcomb & E.L. Hartley (Eds.). *Readings in social psychology*. London : Methuen, 1961.

Brown, R. & Hanlon, C. Derivational complexity and order of acquisition in child speech. In J.R. Hayes (Ed.). *Cognition and the development of language*. New York : Wiley, 1970.

Cazden, C.B. *Child language and education*. New York : Holt, 1972.

Donaldson, M. Positive and negative information in matching problems. *Brit. J. Psychol.* 1959, *50*, 253–262.

Ervin-Tripp, S. Discourse agreement : how children answer questions. In J.R. Hayes, (Ed.). *Cognition and the development of language*. New York : Wiley, 1970.

Heber, M. Questions asked by two groups of seven year old boys differing in social class. Working paper : Univer. Southampton, 1972.

Lewis, B.N., Horabin, I.S. & Gane, C.P. Flow charts, logical trees and algorithms for rules and regulations. *CAS Occasional paper No. 2*. London : Her Majesty's Stationery Office, 1967.

Menyuk, P. & Bernholtz, N. Prosodic features and children's language production. *Quarterly Progress Report No. 93*. M.T.T. Research Laboratory of Electronics, April, 1969, 216–219.

Mosher, F.A. & Hornsby, J.R. On asking questions. In J.S. Bruner, R.R. Olver & P.M. Greenfield (Eds.). *Studies in cognitive growth*. New York : Wiley, 1966.

Olver, R.R. & Hornsby, J.R. On equivalence. In J.S. Bruner, R.R. Olver & P.M. Greenfield (Eds.). *Studies in cognitive growth*. New York : Wiley, 1966.

Rackstraw, S.J. Making questions to fit answers. unpub. mss, University of Southampton : Rowntree Project, 1970.

Robinson, W.P. *Language and social behaviour*. Harmondsworth, Middlesex : Penguin, 1972.

Robinson, W.P. & Rackstraw, S.J. *A question of answers*. London: Routledge, 1972.

Williams, F. & Naremore, R. On the functional analysis of social class differences in modes of speech. *Speech Monographs*. 1969, *36*, 77–102.

CHAPTER 8 WHO IS TO BE ASKED? (C.D. CREED)

8.1 THE PROBLEM OF WHO TO ASK

8.2 METHOD

8.3 RESULTS

8.4 DISCUSSION

8.5 REFERENCES

CHAPTER 8

WHO IS TO BE ASKED? (C.D. CREED)

Editor's Introduction. In chapter 6 we have reported briefly upon ways of finding out, and we have related these to a variety of problems for a small sample of children. One of the means available was to ask someone. Whether or not it is sensible to ask someone will depend upon a number of factors: whether it is the sort of question to which someone might know the answer, whether other means are readily available, whether a suitable person is readily at hand, whether or not you are prepared to ask someone.

For example, if you wish to know where a particular path on Dartmoor leads when you are standing there in splendid isolation on a rainy winter's day, reading any visible signpost or consulting an Ordnance Survey map is a better bet than waiting for someone as eccentric as yourself to appear. If neither are available, then you may have to walk and see where a path leads. Observation and experiment are generally reliable and valid means for answering empirical questions, and are especially useful strategies when those people who might know are absent or when no one actually knows. Of course, you might decide to wait for the eccentric to appear and ask him. If he is wearing a certain prison-like uniform, you may decide he is unapproachable. If his reply mentions Timbuktoo or is delivered with too much uncertainty, you may judge him unreliable. If you yourself are an officer in charge of a platoon of men on a map-reading exercise, you may be embarrassed to admit your ignorance in front of your men. There are then a variety of circumstances which would reduce or eliminate the probability that you ask a question of another person, but if you do decide to, who do you ask?

In this chapter interest is focused upon eight types of receiver of questions for five categories of question and six categories of asker. For one type of receiver, the teacher, an analysis is made of attributes relevant to being selected as a question-victim. Additionally and briefly, the relevance of having a suitable time and place to ask is considered. This investigation, relying as it does on verbal reports, has the advantages and disadvantages inherent in this method. While we might expect replies to be reliable in that the subjects would be likely to give very similar answers if asked again, we could have doubts about the validity of their answers. How do we know they bear any direct correspondence to the natural behaviour of the pupils? Ideally we would have liked to supplement this investigation with detailed observation of the children's behaviour, but, both technically and administratively, this would have been a difficult and costly operation. It would have meant, for example, the research worker following a small sample of children around in the classroom, the playground, the home and elsewhere, noting what they asked of whom – and perhaps vainly hoping that his presence was not influencing behaviour. Some partial observational support would have been welcomed, but we thought it better to rely on other criteria. The first was the nature of the school. Suffice it to mention two points. Our research was accepted enthusiastically and cooperatively by both pupils and staff, so that we can have some faith in the generalisation of this goodwill. Secondly, a number of teachers had instituted questioning sessions during which pupils asked what they liked of various staff members; hence the idea of asking teachers questions was not wholly alien to the participants. More direct evidence comes after the fact. That the results made sense, and a reasonable interpretation could be offered, is additional evidence for the validity of the replies.

The study reported is only one instance of many combinations of variables that might be examined. From a practical point of view one would like to know whether there are variations in school structure associated with variations in perceived availability, approachability and expertise of teachers? Is there any systematic difference with the age of children both in the extent to which they are encouraged to ask questions and the extent to which they wish to. Bernstein (1972) has found that the child who asks many questions (of an unspecified nature) is seen differently by teachers at age five and seven and in middle and working class schools.

At time 1, (age five) in the WC area, child-initiated communication (explanation and questioning) was seen by teachers as being independent of co-operativeness and attentiveness, both of these being features of an 'appropriate' relationship to the teacher. This may be because, for the WC child, this is something *he has to learn.* However, the MC child has been socialised into the 'appropriate' social relationship in his family and, therefore, at time 1, the quartet of explanation, questioning, co-operativeness, and attentiveness, are all highly intercorrelated. In the WC area, by time 2 (age seven), it was found that the quartet was *more* closely related, so that the child-initiated activities (explanation and questioning) and appropriate social relationships were by then linked. In other words, during the WC child's two years in the Infant School, he is being socialised into an appropriate relationship to the teacher. The latter involves the WC child, relative to the MC child, coming to do what the teacher wants; learning the conduct that the teacher expects. *'Child-initiated cognitions are mediated through a social relationship in which the teacher's values and attitudes are dominant'* (Bernstein, 1972 *p.* 33).

Obviously we would like to know more about the teachers' understanding of what was meant by 'a child who asks a lot of questions'. The child who keeps asking task-relevant questions may well be viewed rather differently from one who keeps asking about the teacher's clothes or pets. How age and personality of child relate to the type and frequency of questions asked of others, particularly teachers, is again a more general question beyond our present possibilities. However, while it is with some regret that we can offer no systematically collected data of real questions asked of real teachers by real children, we were able to append a supplement to chapter 4 comprising an analysis of a number of questions collected during the questioning sessions mentioned earlier.

8.1 The Problem of Who to Ask

It is generally believed that many children in secondary schools show little interest in and ask but few questions about their school-time activities. 'Too many appear to be bored and apathetic in school' (Newsom Report, para. 47). It may be argued that, with respect to questioning behaviour, there are two separate problems here: a problem of *stimulation,* how to increase curiosity among children who are not curious, and a problem of *elicitation,* how to provide conditions that will encourage children to ask questions they already have. It is with this second problem of elicitation that this investigation is concerned. We are concerned only with asking other people questions and not with other means of finding out answers and we look at three factors likely to be of importance. These are, firstly, the relative expertise of the person who may be asked, secondly, certain psychological attributes of this person, and lastly, the situation in which the question may be asked.

Firstly, the would-be question-asker must find another person whom he perceives as having an interest in the topic with which he is concerned; and a greater amount of knowledge on this topic than he himself has. Such a person may be called an 'expert'. There are reasons, other than his knowledge of the question-topic, which will cause a person to be seen as an 'expert'. For example, Aronson and Golden (1962) found that irrelevant aspects of a communication may affect the likelihood of that message being accepted, *e.g.* a white Caucasian source message was seen as more credible than a Negro source message even when the communication concerned topics to which race-membership was irrelevant. Teachers may, for example, merely by virtue of their status as teachers, be perceived by children as being experts upon a whole variety of topics about which in fact they are no more or less likely to have knowledge than anyone else.

Secondly, having found someone whom he views as an expert, the would-be questioner has the problem of whether or not this person is 'psychologically approachable'. It is assumed, for example, that a questioner is more likely to ask an expert who is a friend than to ask one who is an enemy. It is probable that a person is more likely to be seen as being approachable if in the past there has been a greater opportunity of interaction and if this interaction has previously been rewarding for the questioner. It is also probable that this factor of approachability will become more salient to the questioner as the topic about which the question is to be asked becomes more ego-involving or embarrassing to the questioner. Presumably, however, this 'approachability' factor could become increasingly less important as the questioner's need to know the answer increases.

Finally, when an approachable expert has been selected, the potential question-asker must still consider whether or not the time and place are appropriate for asking. There are different norms associated with different interaction situations which relate to whether or not questions may be asked. To take an extreme example, in most interviews the flow of questions goes only one way; and only if the interviewer specifically asks him does the interviewee ask questions. However, in a conversation between two friends no such constraints are apparent.

Such ideas about the expertness and approachability of the other person, and the appropriateness of the situation, are perhaps obvious and general. However, we have no hard evidence on the subject and cannot make any supported statements of detail about who asks whom, what, when, and where. This investigation opens up this field of inquiry. Children were given a series of questions and asked to imagine that they wanted to know the answers to them. They were then asked to whom they could and would go in order to find out the answers. While such a procedure is artificial, the greater amount of data bought at this cost may be worthwhile. The children were also asked whether they preferred to ask questions of teachers and parents when alone or not. Teachers were asked to fill in questionnaires so that we might find out what teacher characteristics might be related to the children's choices.

8.2 Method

Subjects: The Children. Fifty three girls and sixty six boys from a creamed comprehensive school took part. High and low IQ were created by dividing each age group at the mean on Moray House Verbal Reasoning scores. The mean score of the twelve year olds was 86.7, of the fourteen year olds 94.7. Two way divisions on sex, age, and IQ gave eight groups.

1. 16 12 year old boys, high IQ (88 and above)
2. 20 12 year old boys, low IQ (87 and below)
3. 19 12 year old girls, high IQ (88 and above)
4. 13 12 year old girls, low IQ (87 and below)

5. 18 14 year old boys, high IQ (95 and above)
6. 12 14 year old boys, low IQ (94 and below)
7. 10 14 year old girls, high IQ (95 and above)
8. 11 14 year old girls, low IQ (94 and below)

Subjects: The Teachers. The school from which the children's sample was drawn had forty nine teachers. All teachers in the school were sent a questionnaire with a covering letter which stated the purpose of the investigation and asked for cooperation. Twenty seven teachers returned the questionnaire (fourteen male, thirteen female).

The School. The school from which these samples were drawn was a county secondary school in the south of England. The mainly rural area contained one smallish town which was supported by a large military establishment. The mean Moray House Verbal Reasoning scores reported above may seem to be low, but were in fact typical of the whole school. There was in this school already in existence a system whereby pupils handed their written questions about any topic to teachers. Consequently, it is argued that children in this school would not see it as odd to be asked which teachers they would go to in order to have their questions answered; although this would not be the case in some other schools.

Materials:

The Children's Questionnaire. The children were presented with a list of twenty one questions and asked to imagine that they wanted each of them answered and then to indicate to whom they could and would go for an answer. There were five types of question-content with four examples of each. The additional question was one used during the instruction procedure in order to show the subjects how to fill out the questionnaire. There are many ways in which questions may be categorised by an investigator to give him 'type of question' categories. The categorisation of questions chosen here reflects our expectation that a questioner's choice of an answerer will depend in part upon the content of the question. The five types of questions were:

1. Questions asking for information about the physical world.
2. Questions asking for explanations of phenomena in the physical world.
3. Questions asking for information about the social world.
4. Questions asking for 'empirical' explanations of the social world.
5. Questions asking for 'moral' explanations of the social world.

These five types of questions are self-explanatory except perhaps for the fourth and fifth categories. 'Empirical' questions about the social world are questions that are asking for explanations of the processes and laws that govern human behaviour, *e.g.* 'Why do people hit other people?'; no value judgements are required to answer these. 'Moral' questions about the social world are questions concerning ethics and value judgements, and appealing to moral codes, *e.g.* 'Why is it wrong to hit people you do not like?'. The reason for including questions asking for both information and explanation was that it was anticipated that answers to questions asking for explanations might be more complex and longer, and therefore more difficult to understand that answers given to information questions. For this reason, the factor of approachability might be more salient since the answerer might have to repeat or reformulate his answers, and expertness might be important in that fewer people may be capable of giving satisfactory explanations.

The actual instances of the five types of question that were used in this investigation may be found in Appendix 1. The questions were drawn up in consultation with three fourteen year old girls who agreed that the questions finally decided upon were in fact questions that children of their age might often want to ask.

The order in which the twenty questions were presented to the subjects was random, but the same for all subjects (this order may be found in Appendix 1). Questions were presented singly to the subjects. Below each qeustion was a list of role-titles (unfamiliar peer, friendly peer, any adult, mother, father, any teacher, particular teacher, somebody else). The subjects were required to indicate whether they thought each person would know the answer to the question, whether each would be chosen by the subjects for answering the question, and which of them would be the first choice. Subjects were required to fill in the name of a particular teacher for each question, whereas the specification in 'somebody else' category was at their discretion. Following this, the subjects were asked whether they would prefer to ask this question of the chosen teacher in classtime with others present or in breaktime alone. They were also asked whether they would prefer to ask a parent with both parents present or with one parent alone. An example of one question and its format in the questionnaire is shown in Appendix 2. This format was the same for all questions.

The children's questionnaires were scored by counting the proportion of children in each group that made use of each of the choices available to them.

Materials

The Teachers' Questionnaires. The children's questionnaire provided data about which teachers were chosen to answer which types of questions. The problem arises as to whether there are any specifiable attributes that may characterise teachers chosen to answer one particular type of question. In order to make some attempt at answering this problem, all the teachers in the school were sent a questionnaire with a covering letter asking for their help by filling in the questionnaire and returning it. Of the forty nine teachers in the school, twenty seven returned the questionnaire. This questionnaire attempted to assess some of the teacher's attitudes towards teaching, education and classroom control, and also included a personality assessment and some personal details, *e.g.* age, sex, number of years teaching *etc.* The full set questionnaires may be found in Appendix 3. Details for scoring them are also in Appendix 4. The various scales used within each questionnaire are briefly described below.

1. *Opinionaire on Attitudes towards Education* (see Q.1, Appendix 3). This forty five item scale was devised by Lindgren and Patton (1958). Five items in the original scale were omitted, *viz.* items 1, 8, 11, 17 and 30. The word 'pupil' was substituted for 'student' because it is the more usual term of reference for children of this age in England. The scale measures attitudes towards child-centred policies and practices in education. 'The statements are concerned with the desirability of the teachers using authoritarian methods as a means of controlling the behaviour of students, and the desirability of the subject-matter-centredness as contrasted with learner-or-child-centredness.' (Shaw and Wright 1967, *p.*80). A high score indicates more favourable attitudes towards child-centred policies.

2. *Social Intimacy Scale for Teachers* (see Q.2, Appendix 3). This scale was devised specifically for this investigation. The scale consists of thirteen contrastive pairs of

statements concerning social behaviour towards and expected from pupils. An example of one such pair of statements is:

Item 1. I address both boys and girls by their Christian names.
Item 14. I expect pupils to address me by my Christian name outside school.

Teachers were asked to indicate the extent of their agreement with such statements. The scale purports to measure three variables. These are: (1A) the extent to which the teacher moves towards social intimacy with the pupils, (1B) the extent to which the teacher lets the pupil move towards him and (1C) the degree of reciprocity between how he behaves towards the pupils and how he expects them to behave towards him.

3. *The Eysenck Personality Inventory.* This scale, devised by Eysenck and Eysenck (1964), purports to measure neuroticism and extraversion/introversion.

4. *The Educational Guessing Game Scales* (see 1.4, Appendix 3). This scale was devised specifically for this investigation by Robinson. It consists of twenty six statements taken from the writing of various prominent educationalists of the past. Teachers were asked to indicate their agreement or otherwise with these statements. While doing this task, they were not aware of the authorship of the statements. At the end of the task, they could open an envelope which contained the author key.

The answers of the first eighteen teachers to return the completed questionnaire were used to construct a correlation matrix (see Appendix 5) from which clusters of items could be extracted. The items formed two main groups. The first could be called a 'Free development potential scale' (F.D.P.S.). It contained ten items and a high score on this scale could be said to be characterised by the following set of beliefs: 'the child has a natural capacity for curiosity and for spontaneous moral development which is brought out (or should be) by a free (non-restrictive, non-punitive) and affectionate environment and love. Early experience of love is seen as especially important for the young child'. The second cluster, the 'Training Scale' (T.S.), contained eight items and a high score on this scale could be said to indicate the following set of beliefs: 'the child becomes too wild (and children are amenable to discipline and punishment); the child needs to be told what it is necessary for him to know in a formal manner; competence is largely predetermined (inherited).'

Procedure: Instructions for the children. The format of one question (see Appendix 2) from the children's questionnaire was written on the blackboard of the classroom so that the procedure could be explained to the children. The Experimenter (E) in fact went through the filling out of this first question with the children. The question used for this purpose was:

'Which county in England has the highest temperature in June?'.

This question was used only for procedural purposes and was not scored in the later analysis. The instructions were as follows:-

> 'Listen very carefully because what we have to do is a bit complicated. We want to know who you like to get to answer your questions. On the paper in front of you there are twenty one questions. After each question there is a list of people who you might ask. I'll show you an example on the board so you can see what you have to do with each of the questions. Here, at the top of the board, I've written the first question that you have on your sheets. 'Which county in England

has the highest temperature in June?' Underneath, we have 8 different people . . . (here E. reads through the format of the first question as shown in Appendix 2). Then you come to question 2, and you get exactly the same layout for this question. All right, so that's what it's like. Let's go back to the beginning to see what you have to do. The first question then is 'Which county in England has the highest temperature in June?' Now I want you to imagine you want to find out the answer to this question. Even if you know the answer already, I want you to pretend you don't know it and imagine you want to find the answer out. First of all I want you to think of all the teachers in the school. Which one would you most like to ask this question? Right then, all of you think which teacher you'd most like to ask this question, if you really wanted to know the answer. Then write that teacher's name in (g) like this. (E. writes a name in the appropriate place on the board). Put any teacher's name you like as long as they are at this school. Now you've done that, I want you to think which of all these people will know the answer to 'Which county in England has the highest temperature in June?' (E's fingers run down the board indicating the people) except this one (points to 'somebody else'). I'll do it now for myself. Well, I don't think (a) would know, so I put an X here (E. points to the appropriate box and makes the mark), I do think (b) knows, so I put a tick here. (E. goes through all the names). Of course, you might well want to answer differently, because these people are not the same for you as they are for me. Right now, you all do that for yourselves. O.K.! Now, have you all done that? Good. Now, some of the people who you think know the answer, you would go and ask – some maybe you wouldn't want to ask. In the column, marked 'would choose' tick all those who you would ask, like this, and put crosses for the ones you wouldn't ask. (E. does this on the board for himself). Right, now you do that for yourselves still leaving the 'somebody else' blank. (Subjects do this). Now, from the ones you've chosen, I want you to tick the one who would be your first choice – like this if it were me. If there is somebody else who isn't on the list, but who would be your first choice, then write their name here and who they are and put a tick here (E. points to 'somebody else' box). For example, if you have an uncle who is a weatherman, you might want to ask him as your first choice, so write in 'uncle' and put 'weatherman' like this, and then put a tick in the 'somebody else' box. But otherwise if your first choice is one of these people, just put a tick and leave 'somebody else'. All right, now all tick your first choice. O.K.? Good. Now, all you have to do is answer these two questions here like this (E. reads the questions aloud and answers them on the board). You have to answer these two, after all the questions. Now all do it for this question. (E. now briefly recapitulates the whole procedure and writes a summary of the major steps in the procedure on the board.) Before you start are there any questions? Is there anything you don't understand? You can write in any names you like because I shall be the only person to see them, none of your teachers will be looking at them. Don't forget you can choose the same teacher for lots of the questions if you like, or different ones, just choose the one you want for each question. All right, now start. If you have any problems put up your hands.'

Children took fifteen to twenty five minutes to complete the questionnaire.

Procedure: Instructions for the teachers. A covering letter was sent out with the questionnaire. Instructions concerning the filling-in of the various scales were written at the head of each scale. Copies of both are to be found in Appendix 2.

Treatment of results. The results are presented in four major sections (A – D):

A. Analysis of the children's questionnaire provides data concerning the following dependent variables.

(1) Children's choices of those who are thought by them *to know* the answers to

the questions.

(2) Children's choices of those whom they *would choose* to answer the questions.

(3) Children's *first choices* for answering the questions.

(4) Children's preferences for classtime or breaktime for asking teachers.

(5) Children's preferences for asking a parent while the other parent was *present or not.*

These data were analysed with respect to the following independent variables.

(1) The eight subjectgroups (see subject section).

(2) The five types of question.

(3) The seven different possible answerers.

These analyses of variance were performed upon scores expressed as percentages of children making the various choices.

B. Analyses of the teachers' questionnaires provide a number of measures for each teacher. These scores are treated by a correlation analysis and the resultant matrix analysed by the technique of 'principal components'.

C. Each teacher could be given forty scores derived from the percentage of children in each of the subject groups who choose that teacher for each of the types of question. These scores were submitted to both correlational and principal components analyses.

D. A regression analysis was performed, with the number of children's choices for each teacher as the dependant variable and the scores of the teacher that were derived from the teachers' questionnaire as independant variables.

8.3 Results

A. *Analysis of Children's Questionnaire*

1. *Which persons would know answers.* An analysis of variance performed upon the raw data shown in Table 1 revealed the following differences.

(a) Girls were more likely than boys to think that other people would know the answers to these questions (F = 11.16, df 1/266, p <.01).

(b) Low IQ children were more likely than High IQ children to think that other people would know the answers to these questions. (F = 5.47, df 1/266, p <.05).

(c) There were significant differences between the Types of questions (F = 8.98, df 4/266 p <.01). Children thought that the answers to some Types of questions were more likely to be known than those to others. The order from most to least was: social moral, physical explanation, social empirical, social information, physical information.

(d) Children thought that certain people were more likely to know the answers to these questions than were other people (F = 387.85, df 6/266, p <.01). From the people most likely to know through to the least likely to know, the order was: particular teacher, father, mother, any teacher, friend, any adult, any peer.

(e) There was a singificant interaction of Sex and Type of answerer (F = 4.87, df 6/269, p <.01), i.e. boys were more likely than girls to think that the teacher and any peer would know the answers, whereas girls were more likely to think particular teacher, father, mother, any adult and friend would know.

(f) There was a significant interaction of IQ and Type of question (F = 6.26, df 4/209, p <.01), i.e. High IQ children were more likely than Low IQ children to think the answers to social moral types of questions, would be known, whereas Low IQ children were more

Table 8.1 Percentages of Children Who Assert that Given Persons *would know* Answers to Questions

			Physical Information	Physical Explanation	Social Information	Social Empirical	Social Moral
			Pe Fr Ad Mo Fa Te PT	Pe Fr Ad Mo Fa Te PT	Pe Fr Ad Mo Fa Te PT	Pe Fr Ad Mo Fa Te PT	Pe Fr Ad Mo Fa Te PT
Twelve Years	Boys	High	9 28 9 45 62 23 92	12 48 20 65 81 29 95	6 21 15 51 70 34 90	6 26 15 66 73 32 90	9 25 20 73 76 40 89
		Low	20 51 28 56 82 43 91	23 43 37 63 86 46 93	20 37 35 70 76 47 86	12 31 31 62 81 43 87	12 31 30 62 82 45 88
	Girls	High	3 44 23 43 89 25 96	9 51 39 65 92 42 100	10 39 32 42 82 40 90	11 30 34 60 89 32 85	17 43 32 77 89 42 98
		Low	17 63 19 63 80 38 96	7 61 28 75 86 30 88	11 57 32 73 78 44 82	9 53 32 82 86 42 94	17 57 26 73 86 48 92
Fourteen Years	Boys	High	5 48 23 34 65 38 94	16 45 27 38 63 47 97	11 44 18 36 58 38 83	19 47 31 63 80 55 94	19 47 54 72 84 63 93
		Low	8 25 25 37 66 43 89	12 41 22 52 66 47 91	12 35 25 50 70 64 85	10 35 33 47 75 60 93	14 41 39 64 75 62 93
	Girls	High	12 52 20 32 70 35 97	17 60 32 52 72 62 95	15 20 32 47 57 45 95	10 55 37 62 65 55 92	30 47 47 72 62 60 92
		Low	4 54 15 40 79 31 100	11 50 22 47 75 50 100	9 52 34 52 86 45 93	4 47 34 54 79 45 95	4 43 34 68 86 43 88

Pe – Peer, Fr – Friend, Ad – Any Adult, Mo – Mother, Fa – Father, Te – Teacher, PT – Particular Teacher likely than High IQ children to think that the answers to the social information, social empirical and physical information questions would be known.

(g) There was a significant interaction, Type of question x Type of answerer (F = 3.93, df 24/209, p <.01), *i.e.* children saw 'any peer' as more likely to know the answers of some questions than others; from most to least likely the order was: social moral, physical information, social empirical.

'friend' (most→least)	physical explanation, physical information, social moral, social empirical, social information.
'adult' (most→least)	social moral, social empirical, physical explanation, social information, physical information.
'mother' (most→least)	social moral, social empirical, physical explanation, social information, physical information.
'father' (most→least)	social moral, social empirical, physical explanation, physical information, social information.
'particular teacher' (most→least)	physical explanation, physical information, social moral, social empirical, social information.
'teacher' (most→least)	social moral, physical explanation, social empirical, social information, physical information.

(h) There was a significant interaction of Sex x IQ x Type of answerer (F = 6.15, df 6/106, p <.01) *ie.* Low IQ girls were more likely than other groups to think that:- friend, mother, and father would know the answers. High IQ girls were more likely than the other groups to think that particular teacher and any adult would know. Low IQ boys were more likely than the other groups to think that any peer and any teacher would know.

2. *Which persons would be chosen.* An analysis of variance performed on the raw data shown in Table 2 revealed the following differences.

a) Twelve year olds would choose a greater number of people to answer these questions than would fourteen year olds (F = 19.08, df 1/226, p <.01).

b) Low IQ children would be more prepared to choose a greater number of answerers than would high IQ children (F = 14.82, df 1/266, p <.01).

c) Some answerers were chosen much more often by the children than were others (F = 684.51, df 6/266, p <.01). From most to least choices, the order was: particular teacher, father, mother, friend, any teacher, any adult, any peer.

d) There was a significant interaction between Age and IQ (F = 18.76, df 1/209, p <.01), *i.e.*, although Low IQ twelve year olds would choose a greater number of answerers than would High IQ twelve year olds, this difference was not apparent among the two fourteen year olds IQ groups.

e) There was a significant interaction of Age and Type of answerer (F = 12.90, df 6/209, p <.01), *i.e.*, twelve year olds were more likely than fourteen year olds to choose any peer, any adult, mother, father, any teacher, whereas fourteen year olds were more likely than twelve year olds to choose a friend and a particular teacher.

f) There was a significant interaction of IQ and Type of answerer (F = 5.73, df 6/209, p <.01), *ie.*, High IQ were more likely than Low IQ to choose a friend and mother, whereas Low IQ children were more likely to choose any peer, any adult, father, any teacher, and a particular teacher.

g) There was a significant interaction between Age x IQ x Type of answerer (F = 3.37, df 6/106,

Table 8.2. Percentages of Children who *Would Choose* Various Answerers

			Physical Information							Physical Explanation							Social Information							Social Empirical							Social Moral						
			Pe	Fr	Ad	Mo	Fa	Te	PT	Pe	Fr	Ad	Mo	Fa	Te	PT	Pe	Fr	Ad	Mo	Fa	Te	PT	Pe	Fr	Ad	Mo	Fa	Te	PT	Pe	Fr	Ad	Mo	Fa	Te	PT
Twelve Years Old	Boys	High	9	40	10	62	67	21	89	6	48	7	75	82	17	82	9	40	9	57	67	15	84	1	35	10	78	76	23	85	1	39	12	78	78	23	71
		Low	17	45	23	58	77	35	80	25	50	31	65	83	35	95	15	33	23	65	86	36	85	7	36	22	55	80	33	83	8	40	21	62	82	31	87
	Girls	High	2	44	15	48	92	11	85	3	46	14	61	88	19	89	6	34	18	50	86	22	81	1	34	15	59	90	21	73	3	30	17	69	78	18	77
		Low	15	63	23	59	78	28	90	3	69	21	67	82	28	92	7	53	23	75	84	32	86	1	44	21	80	84	38	88	7	44	15	73	80	34	82
Fourteen Years Old	Boys	High	1	59	2	43	75	19	93	0	51	4	43	70	23	90	2	50	8	47	70	20	83	1	44	6	62	80	27	88	0	37	9	58	70	23	86
		Low	4	45	8	39	70	16	87	0	56	8	60	81	27	93	0	43	8	64	75	35	83	4	47	8	54	75	27	89	6	41	12	56	77	31	91
	Girls	High	5	60	12	50	67	12	97	10	70	12	62	65	17	92	7	40	10	57	60	17	90	5	57	10	65	60	10	90	7	56	12	75	52	7	82
		Low	4	31	4	34	70	22	93	2	45	2	43	75	25	93	2	38	18	45	77	25	90	2	43	18	40	75	27	93	4	40	15	65	79	27	88

Pe – Peer, Fr – Friend, Ad – Any Adult, Mo – Mother, Fa – Father, Te – Teacher, PT – Particular Teacher.

Table 8.3 Percentages of Children Making 'First Choice' of Various Persons

			Physical Information								Physical Explanation								Social Information								Social Empirical								Social Moral							
			Pe	Fr	Ad	Mo	Fa	Te	PT	Se	Pe	Fr	Ad	Mo	Fa	Te	PT	Se	Pe	Fr	Ad	Mo	Fa	Te	PT	Se	Pe	Fr	Ad	Mo	Fa	Te	PT	Se	Pe	Fr	Ad	Mo	Fa	Te	PT	Se
Twelve Years	Boys	High	0	4	0	12	15	3	47	17	0	4	0	20	9	1	57	6	0	1	0	10	21	1	53	10	0	4	0	20	14	3	45	12	0	1	0	29	10	3	42	9
		Low	1	3	1	8	25	1	58	0	1	1	2	10	16	5	62	1	0	1	1	11	18	3	55	8	1	1	2	10	30	3	47	2	1	2	3	10	21	6	53	0
	Girls	High	0	1	1	6	25	8	61	3	1	7	0	9	6	0	71	3	0	5	0	6	30	2	35	19	0	7	0	7	32	2	42	6	1	5	0	27	17	3	31	5
		Low	0	0	0	9	25	5	59	0	0	0	1	13	21	1	59	0	0	3	0	19	26	0	44	5	0	0	1	26	19	1	46	0	0	3	1	19	26	0	48	0
Fourteen Years	Boys	High	0	11	0	2	19	2	58	5	0	2	0	1	13	2	79	0	1	5	0	11	25	1	50	5	0	5	0	6	22	5	52	6	0	7	0	15	26	2	51	1
		Low	0	2	2	6	22	2	56	6	0	4	2	8	20	8	60	4	0	2	4	6	20	6	52	4	0	2	6	8	18	0	58	4	0	0	4	10	25	0	60	0
	Girls	High	2	2	0	10	30	0	55	0	0	7	0	15	17	0	55	5	0	0	0	15	17	0	45	12	0	5	0	12	27	0	40	10	0	5	0	45	15	0	35	0
		Low	0	6	0	4	22	2	61	2	0	0	0	6	22	2	68	0	0	6	0	11	27	6	45	2	0	6	0	11	20	4	57	4	0	4	0	20	36	2	36	0

Pe – Peer, Fr – Friend, Ad – Any adult, Mo – Mother, Fa – Father, Te – Teacher, PT – Particular Teacher, Se – Somebody else.

p < .01), *i.e.* Low IQ twelve year old children were more likely than other groups to choose any peer, any adult, and any teacher; High IQ twelve year olds were less likely than the other groups to choose a friend and a particular teacher; High IQ fourteen year olds were more likely than other groups to choose a friend; Low IQ fourteen year olds were less likely than other groups to choose mother.

3. *First choice of answerer.* An analysis of variance performed upon the raw data shown in Table 3 reveals the following differences.
a) There was a significant difference between Type of answerer (F = 412.14, df 7/305, p <.01), *i.e.* some answerers were chosen first more often than others (F = 412.14, df 7/305, p <.01). From those chosen most through to those chosen least the order was: particular teacher, father, mother, someone else, friend any teacher, any adult, any peer.
b) Boys were more likely than girls to make first choices of any adult, any teacher, particular teacher, someone else; girls were more likely than boys to make first choices of friend, mother, father (F = 4.24, df 7/241, p <.01).
c) There was a significant difference between High and Low IQ children (F = 4.63, df 7/241, p <.01), *i.e.* High IQ children were more likely than Low IQ children to make first choices of friend, mother, and someone else, whereas Low IQ children were more likely to make first choices of any adult, father, any teacher and a particular teacher.
d) There was a significant difference between Types of question (F = 6.60, df 28/241, p <.01). Children were more likely to prefer mother as a first choice for social moral questions to other types of questions and were less likely to choose fathers to answer physical explanation than for other types of questions. Children were more likely to choose particular teachers to answer physical than social questions.

4. *Where to ask teachers.* An analysis of variance performed upon the raw data shown in Table 4 revealed the following differences.
a) Twelve year olds were more likely to ask the question in breaktime than classtime, whereas fourteen year olds were more likely to choose to ask the question in classtime than in breaktime (F = 36.83, df 1/49, p <.01).
b) Boys were more likely to ask questions in classtime than in breaktime, whereas girls were more likely to ask questions in breaktime than classtime (F = 11.24, df 1/49, p <.01).
c) There was a significant difference from the interaction of Sex and Age (F = 401.35, df 1/21, p <.01). Boys and fourteen year old girls preferred classtime to breaktime, whereas twelve year old girls prefer breaktime to classtime.

5. *Asking parents alone or together.* An analysis of variance performed on the raw data shown in Table 5 revealed the following differences.
a) Children preferred to ask parents together rather than alone (F = 134.01, df 1/71, p <.01).
b) Twelve year olds were more likely than fourteen year olds to choose asking parents alone (F = 22.07, df 1/49, p <.01).
c) High IQ children were more likely than Low IQ children to choose asking parents alone (F = 18.19, df 1/49, p <.01).
d) Children were more likely to choose to ask social moral questions alone than they were other types of questions (F = 2.87, df 4/49, p <.05).

Table 8.4 Percentages of Children stating Preferences for Where they would like to Ask Questions

			Physical Information		Physical Explanation		Social Information		Social Empirical		Social Moral	
			Class	Break	Class	Break	Class	Break	Class	Break	Class	Break
Twelve Years	Boys	High	59	40	60	39	57	42	57	42	45	54
		Low	56	42	65	35	72	27	60	40	56	43
	Girls	High	32	67	32	67	35	64	31	68	26	73
		Low	28	71	25	75	25	75	25	75	19	80
Fourteen Years	Boys	High	52	47	59	40	47	52	59	40	43	56
		Low	66	33	70	29	62	37	60	39	62	37
	Girls	High	67	32	70	30	67	32	75	25	67	32
		Low	65	34	65	34	70	29	68	31	61	38

Table 8.5 Percentages of Children preferring to Ask Questions of Parents Alone or Together

			Physical Information		Physical Explanation		Social Information		Social Empirical		Social Moral	
			Together	Alone	Together	Alone	Together	Alone	Together	Alone	Together	Alone
Twelve Years	Boys	High	65	43	68	31	67	32	62	37	46	53
		Low	53	46	53	46	51	48	51	48	45	55
	Girls	High	60	39	63	36	59	40	65	34	63	36
		Low	69	30	76	23	63	36	75	25	71	28
Fourteen Years	Boys	High	68	31	68	31	73	25	66	33	56	43
		Low	83	16	87	12	87	12	77	22	70	29
	Girls	High	57	42	62	37	65	35	60	40	42	57
		Low	90	9	88	11	86	13	81	18	77	22

e) There was a significant interaction of IQ and Age (F = 109.09, df 1/21, p <.01). Fourteen year old Low IQ children were much less likely to choose alone than were either fourteen year old High IQ children or both IQ groups aged twelve.

B. *Analysis of Teachers' Questionnaires*

The scores taken from the teachers' questionnaire were correlated in a 15 x 15 matrix (Table 6). This matrix was further analysed by the technique of principal components. The scores included in the correlation matrix were as follows:

OPIN	Score on 'Opinionaire on Attitudes towards Education'; a higher score indicates more child-centred attitudes.
LIE	Lie score from Eysenck Personality inventory; a higher score indicates greater amount of 'lying'.
NEUR	Neuroticism score from Eysenck Personality inventory; a higher score indicates greater neuroticism.
EXTRA	Extraversion score from Eysenck Personality inventory; a higher score indicates greater extraversion.
FREE	Free development potential scale; a higher score indicates a greater belief in natural growth.
TRAIN	Training scale; a higher score indicates a greater belief in the desirability of socialising.

Table 8.6. Principal Component Analysis of Teachers' Questionnaires

Component number	1	2	3	4	5	6
Accumulated variance	21.52	40.35	49.52	56.90	62.74	67.82
OPIN	.33	.05	.24	.08	.00	.01
LIE	.00	– .04	.34	– .54	.01	– .24
NEUR	– .05	.08	– .50	.13	.15	– .46
EXTRA	.20	.04	.21	.32	.36	.04
FREE	.28	– .15	.08	– .32	.08	.36
TRAIN	– .23	– .04	– .05	.29	– .07	.54
Int A	.33	– .24	– .06	.04	– .00	– .09
Int B	.40	– .16	– .03	.12	– .09	– .09
Int C	– .29	.23	– .09	– .16	– .25	– .12
SEX	.16	– .11	.09	.35	– .58	– .05
AGE	.14	.42	– .01	– .05	– .17	.19
EXP	.16	.39	– .08	– .16	– .07	.23
nKID	.27	,12	– .22	– .15	– .36	– .05
AgeKID	.24	.29	– .18	– .08	– .10	– .07
QUAL	.04	– .34	– .24	– .35	– .03	.01

Int A	From social intimacy scale; a higher score indicates the teacher gives more intimacy to the child.

Int B	From social intimacy scale; a higher score indicates the teacher allows more intimacy from the child.	
Int C	From social intimacy scale; a higher score indicates a lack of reciprocity between 1A and 1B.	
SEX	Sex of teacher, score 1 for male, 0 for female.	
AGE	Score of 1 (20 – 24 years) Score of 2 (25 – 29 years) Score of 3 (30 – 39 years) Score of 4 (40 – 49 years) Score of 5 (50 and above years)	
EXP	Score of no. of years teaching	1 (0 – 2 years) 2 (3 – 5 years) 3 (5 – 10 years) 4 (over 10 years)
nKID	No. of teacher's children	
AgeKID	Average age of teacher's children	
QUAL	Age range teachers were trained for	0 – untrained 1 – infant 2 – primary 3 – primary/secondary 4 – secondary

The principal components analysis did not show any very clear and definite pattern.

Component 1 –	those scores that represent measures of educational attitudes loaded more highly upon this component, *i.e.* OPIN, FREE, TRAIN, IntA, IntB, IntC.
Component 2 –	those scores that are measures of age and experience load more highly upon this component, *i.e.* Age, Experience, Number of Children, Age of Children, Training.
Component 3 –	mainly the personality scores from the Eysenck Personality inventory.

C. *Choices of Particular Teachers*

1. Choices of Teachers by the Eight different Subject Groups. The number of choices made by each of the eight subject groups for each of the twenty seven teachers were used to provide an 8 x 8 correlation matrix (Table 8.7a). This matrix was further analysed by a principal components analysis. The principal components analysis showed a very clear picture (Table 8.7b).

Component 1	Obviously, a general component, *i.e.* teachers chosen by one group of subjects tend to be chosen by all groups
Component 2	A bipolar component, indicating that the group of teachers who tended to be chosen by twelve year olds is not wholly the same as that chosen by fourteen year olds
Component 3	A component primarily associated with the twelve year olds, indicating that slightly different groups of teachers were chosen by Low and High IQ groups.

Table 8.7a Correlation Matrix of Teacher Choice Consistency across Subject Groups (N=27)

					Groups of Subjects			
	12BH	12BL	12GH	12GL	14BH	14BL	14GH	14GL
12BH		.67	.96	.75	.29	.34	,38	.45
12BL			.62	.83	.27	.30	.33	.32
12GH				.71	.17	.25	.27	.40
12GL					.25	.34	.35	.45
14BH						.93	.93	.65
14BL							.92	.73
14GH								.74

Table 8.7b Principal Components of Teacher Choice Consistency

Component number	1	2	3
Accumulated variance	58.36	84.79	91.67
12BH	.36	.36	.37
12BL	.32	.33	– .64
12GH	.33	.41	.48
12GL	.35	.34	– .36
14BH	.35	– .41	– .10
14BL	.37	– .37	– .04
14GH	.37	– .36	– .03
14GL	.36	– .20	.29

2. *Choices of Teacher by all Children for the five Types of Questions.*

Each teacher received a certain number of choices from the children to answer each of the five types of questions. Thus each teacher may be given a score for each of the five types of question. These scores form a 5 × 5 correlation matrix (Table 8.8a). This matrix was further analysed by a principal components analyses. The principal components analysis (Table 8.8b) presented a clear picture.

Component 1	was a general component, indicating that teachers who are chosen to answer one type of question are generally chosen to answer all other types of question.
Component 2	was a bipolar component indicating that a slightly different group of teachers were chosen to answer physical questions from the group chosen to answer social questions.

D. *Regression Analysis*

(1) A regression analysis was performed using each of the eight subject group scores of the teacher as the dependent variable in separate analyses; while the teachers' scores from the teachers' questionnaire were used as independent variables (that is OPIN, LIE, NEUR, EXTRA, FREE, TRAIN, IntA, IntB, IntC, SEX, AGE, EXP), *i.e.* the dependent

Table 8.8a Correlation Matrix of Number of Choices by Children of Teachers for each of the Five Types of Questions (N = 27)

Type of Question	Physical Information	Physical Explanation	Social Information	Social Empirical	Social Moral
Physical Information		.97	.63	.74	.78
Physical Explanation			.56	.66	.68
Social Information				.78	.79
Social Empirical					.91
Social Moral					

Table 8.8b Principal Components of Teacher Choice for Five Types of Question

Component Number	1	2
Accumulated Variance	80.32	93.15
Physical Information	.46	.47
Physical Explanation	.43	.60
Social Information	.42	– .50
Social Empirical	.46	– .32
Social Moral	.47	– .26

Table 8.9a Regression of Attributes of Teachers upon Choice of Teacher for Various Groups of Subjects

Dependent Variable	Sig. Indep. Variables	Regression Coefficients	t	Partial Correlation
12BH	NONE			
12BL	IntA	1.23	2.08	0.38
12GH	NONE			
12GL	LIE	5.98	3.25	0.55
	SEX	13.99	2.29	0.42
14BH	OPIN	.99	2.56	0.46
14BL	OPIN	.57	2.24	0.41
14GH	OPIN	.82	2.76	0.48
14GL	NONE			

variables were the number of choices a teacher received from each of the eight subject groups. The independent variables that regressed significantly are shown in Table 8.9a. The correlations between all dependent variables and all significant independent variables were also calculated (Table 8.9b).

(2) A regression analysis was performed using each of the five types of question scores of the teacher as a dependent variable in separate analyses, with the teachers' scores

Table 8.9b Correlations between Teacher Choice and Teacher Attributes for Various Groups of Subjects

Teacher Attributes	Groups of Subjects 12BH	12BL	12GH	12GL	14BH	14BL	14GH	14GL
OPIN	.17	.36	.10	.34	.46	.41	.48	.37
LIE	.31	.28	.34	.47	– .18	– .10	– .06	.15
Int A	.25	.38	.23	.37	.09	.08	.12	.17
SEX	.21	.31	.12	.29	.33	.36	.31	.36

Table 8.10a Regression Analysis with Number of Choices made of Teachers for the Different Types of Question

Dependent Variables	Independent Variables	Regression Coefficients	t	Partial Correlation
Physical Information	OPIN	1.10	2.59	.46
Physical Explanation	OPIN	1.30	2.75	.49
	LIE	10.11	2.19	.41
Social Information	SEX	22.52	2.85	.50
Social Empirical	SEX	24.24	2.46	.44
Social Moral	NONE			

Table 8.10b Correlations between Teacher Atrribtues and Teacher Choice for each Type of Question

Attributes	Physical Information	Physical Explanation	Social Information	Social Empirical	Social Moral
OPIN	.46	.45	.27	.42	.35
SEX	.31	.21	.50	.44	.37

from the teachers' questionnaires were used as independent variables. (That is, OPIN, LIE, NEUR, EXTRA, TRAIN, IntA, IntB, IntC, SEX, AGE, EXP), *i.e.* the dependent variables were the numbers of choices a teacher received for each of the five question types. The independent variables that regressed significantly are shown in Table 8.10a. The correlations between all dependent variables and all significant independent variables are shown in Table 8.10b.

8.4 Discussion

The purpose of this investigation was to attempt to specify some of the conditions that might affect the elicitation of questions; especially the characteristics of the other person who might be chosen to answer a question. With the results obtained, this question may be discussed from two points of view. Firstly, are there specific and identifiable characteristics that separate those teachers chosen from those not chosen? Secondly, are the different groups of children (age, sex, IQ) making different choices as to which people they think would know the answers to the questions, which people they would be prepared to choose, and which people they prefer as first choices.

The data reported earlier, in section C of the results, clearly indicate that some teachers are consistently chosen to answer the children's questions whilst others are not. Furthermore, these results indicate that twelve and fourteen year old children are choosing different groups of teachers; twelve year old High IQ children are choosing differently from twelve year old Low IQ children; and at a second order level teachers chosen to answer 'physical' questions are not the same ones as are those chosen to answer 'social' questions.

It can be said therefore that while children are making similar and consistent choices, differences in choice that do occur are associated with the different groups of children and different types of question; in other words the children are not randomly choosing different teachers for different questions. One may therefore assume that sub-groups of children do share common criteria and that the criteria are not identical for the twelve and fourteen year olds, nor for the High and Low IQ twelve year old groups, nor for 'social' as opposed to 'physical' questions. Therefore either there are certain characteristics common to chosen teachers and absent among teachers not chosen, or perhaps certain characteristics are common to those not chosen and absent among those who are chosen. This is probably true whether or not we are able to identify any such characteristics.

Although this conclusion will surprise nobody, it does for this very reason imply that the procedure used in this investigation has probably elicited from the children responses that will correspond to the choices that they would at least like to make in the everyday life, and perhaps, also, correspond to the choices they in fact do make. The question may now be posed as to whether any of the measures that were taken from the teachers in this investigation are related to these different and consistent choices of the children.

The intercorrelations of the fifteen measures from the teachers' questionnaire were subjected to a principal component analysis whose results implied the existence of three clusters of items: an 'experience' cluster of age, number of own children, number of years teaching and training; a 'personality' cluster of the extraversion/introversion and neuroticism scales which, although not correlating highly with each other, were separate from the other variables; and an 'attitudes towards education' cluster of Opinionaire scale, Free Development Belief Scale, and Social Intimacy Scale. On the basis of this principal components analysis we can suggest that measures of experience, personality and educational attitudes have been obtained. The labels of 'experience', 'personality' and 'educational attitudes' should be viewed as 'referential tags' rather than as 'interpretative concepts'. Additionally, it should be remembered that the teachers' questionnaires which yielded these measures contained only two tested and established scales (*ie.* the Eysenck Personality Inventory and the Opinionaire Scale) and this second one has not been used much. The remaining scales were intuitive and unstandardised. With these reservations, it would still seem that the teachers' questionnaires provide a selection of variables that one would imagine may be related to whether or not a teacher might be chosen by a pupil for the purposes of question asking. Can such measures taken from the teachers be used to predict which teachers are chosen?

The regression analysis reported in section D of the results showed that several of the measures taken from the teachers' questionnaire gave better than chance predictions of the number of choices a teacher received from the various groups of children. For fourteen year olds, the teachers' opinionaire score was a better than chance predictor for all groups except the fourteen year old Low IQ girls, but was only weakly so for the twelve year old's choices. It is interesting to note the results reported in section C: these show a correlation analysis of the number of choices received by each teacher for each of the eight subject groups. It may be seen that a principal components analysis produces three components that account for ninety per cent of the total variance. The first component is general, the second component differentiates mainly between the twelve and fourteen year olds, whereas the third component concerns primarily only the twelve year olds and differentiates among them on the basis of IQ. However, although three of the fourteen yaer old groups load negligibly on this third component, the Low IQ fourteen year old girls load in a similar fashion to High IQ twelve year olds, thus suggesting that they are a deviant group.

If we examine the Opinionaire's success for different types of questions, it does so for both information and explanation types of 'physical' questions, but not for 'social' questions. From section A results, we saw that, although children would choose teachers rather than parents for all types of question, they make particular teachers first choices more often for 'physical' than for 'social' questions. Hence, it could be suggested that it is for the 'physical' qeustions that teachers are seen as most useful and for answering these, the Opinionaire socre is a significant indicator of which teachers are preferred.

The only other variable predicting teacher choice was sex. For 'social' questions boys preferred male and girls preferred female teachers.

With the failure of other indices to have predictive value, it is sensible to see how far sheer exposure to different teachers is relevant to choices made. Zajonc (1970) has amassed a sizeable body of data to show that familiarity alone is positively associated with people's preferences, other things being equal. The groups of children have experienced different teachers for their formal teaching, and even within the groups there are certain teachers who have taken the children often and others who have seen them only infrequently. The correlation between the number of hours teachers had taken fourteen year olds and the number of choices received from fourteen year olds was negligible ($r = 0.04$, $t = 0.21$, df 25). Hence, the hypothesis that fourteen year olds were choosing teachers who teach them most often can be rejected. A similar correlation for twelve year olds' choices and number of hours spent teaching them was higher, ($r = 0.37$, $t = 1.98$, df 25, $p < .10$). The hypothesis that twelve year olds were choosing on the basis of exposure has some weak support. The fact that there was a measure of correlation between number of hours and number of choices for twelve year olds but not for fourteen year olds is not surprising. All the children entered this school at the age of eleven. At the time of this investigation the twelve year olds were nearing the end of what was their first academic year at the school. This means that, by and large, they had experienced only one group of teachers since they entered. This would not be the case for fourteen year olds; they would have been taught by one group of teachers in the first year, a second group (even if overlapping with the first group) in their second year, and were nearing the end of a year with their third group. The fourteen year olds therefore would have had the opportunity of knowing more teachers than the twelve year olds and would also know a number of teachers who were not teaching them at the time of the investigation.

As a check that the relationship between Opinionaire scores and teachers chosen among the fourteen year olds was not an artefact of any variation in exposure, the correlation between these two measures was re-calculated for those teachers who were currently teaching that age group for more than one lesson a week. The correlation remained significant. ($r = 0.58$, $t = 2.99$, df 18, $p < .01$).

At the beginning of this discussion two questions were posed; it is now possible to give a tentative answer to the first of these (*i.e.* are there specific identifiable characteristics separating the teachers in this study who were chosen from those not chosen) by pupils to answer questions. There is evidence to show that a high score on the Opinionaire scale is a good predictor of a large number of choices from fourteen year olds to answer their questions (with the exception of fourteen year old Low IQ girls). There is also evidence to suggest that this same Opinionaire score predicts choices from all children for questions about the 'physical' world. A high score on the Opinionaire scale indicates a more favourable attitude towards child-centred educational policies and liberal methods of control as opposed to subject-matter centred policies and authoritarian methods of control. It should also be remembered however that, while the Opinionaire scale appears to be a good predictor, experience as measured, personality as measured, and the various other measures of educational attitudes did not predict choices of teachers.

One explanation of the fact that Opinionaire score was a good predictor for the fourteen year old choices but not for twelve year old choices has been given, *viz.* that twelve year olds have a limited group of teachers from whom they can choose, whereas fourteen year olds may choose from a much wider group of teachers, and that therefore their choices are more likely to reflect what they want an answerer to be like.

Another explanation might be that between the ages of twelve and fourteen the children learn to make different sorts of choices with regard to the answerers they might choose. Both of these explanations may be correct. However, these considerations lead us directly to the second question posed at the beginning of this discussion, *viz.* are the different groups of children (age, sex, IQ) making different types of choices as regards who they think know the answers to the questions, who would they be prepared to choose, and who would be their first choice? The data presented in section A of the results have direct bearing upon this problem. Before discussing these data, an interpretation that we may label the 'exposure-differentiation' hypothesis of choice of answerer is presented.

If we imagine a questioning child who knows nothing about his potential answerers other than that they are available to him, he may ask questions randomly. However, some people will be more frequently available than others, so that we might expect the child simply to ask questions on this basis. However, as he asks more questions, which may or may not be answered, and as he develops greater skill in differentiating between satisfactory and unsatisfactory answers, we might expect him to begin to differentiate between answerers. He should come to see some people as more expert than others, some as more approachable than others, and he may begin to learn that these attributes will depend upon the type of question to be answered. Hence, while availability and total exposure should have a relevance, there should also be increasing differentiation within the set of potential answers and we might expect this to increase with intellectual development and with the number of persons known. (Of course, the differential preferences may be related to reasons other than those mentioned here).

If the age and ability ranges in this investigation are sufficient, and the hypothesis valid, we can expect that older and more able children should show more differentiation in their choice of answerers than younger and less able children whose choices should be mainly a function of amount of contact.

The results reported in section A showed that children believe that 'particular teachers', fathers and mothers would be most likely to know the answers to these questions; these same answerers are most often indicated as being the children's first choices. Of these three types of people, 'particular teachers' are chosen more often than the other two. It must be remembered however that for an individual child the 'particular teacher' chosen may be a different person for the different questions, whereas 'mothers' and 'fathers' are for the individual child always the same person.

There are differences apparent between these three types of answerers with respect to the different types of questions. Children view potential answerers as more likely to know the answers to 'explanation' questions (as opposed to 'information' questions). One may assume that the children therefore see these as easier questions. This is true of both 'mother' and 'father'. However, 'particular teachers' appear to be seen as more likely to know the answers to physical questions than social questions and are also more likely to be chosen to answer physical than social questions.

Given this background which dominates the choices made by the children, are there differences between the various subject groups which support the above differentiation argument?

Considering the data concerning who would know the answers to these questions, it can be seen that Low IQ children think that a greater number of people would know the answers than do High IQ children. In other words High IQ children are limiting themselves to fewer people who would know the answers. This is seen to be true of all types of questions, except 'social moral' questions High IQ groups see a greater range of people as being likely to know the answers to 'social moral' questions than do Low IQ groups. However, 'social moral' questions are the only type of questions (of the five types used in this study) that cannot ever have true or false answers. These questions are (unlike the other types) asking for opinions rather than knowledge. The High IQ groups, it seems, are more likely to realise this and appreciate that anyone may have an opinion. Thus, High IQ groups are more restricted in their beliefs as to who would know answers to 'factual' questions and less restricted for 'opinion' questions. It is argued that this supports the view that High IQ children are more discriminating than Low IQ children in their selection of answerers.

The readers should be reminded at this point of the fact that the so-called 'High IQ' group in this study have a mean IQ that is below the national average. The objection might be made that such an IQ group at this age is unlikely to appreciate the rather philosophical point that while 'factual' answers may have differing relative validity, answers to 'opinion' questions may be equally valid. However, the argument above should be interpreted in this way. What is being said here is that the answers to the 'social moral' questions that the children receive may be found by them to be equally useful or useless, regardless of who is answering (assuming the answerer is co-operative). It is suggested that relative to the lower IQ group, the higher group may learn this more quickly.

However, still considering the 'who would know' data, there is found a sex difference that would not be expected from the 'exposure-differentiation' hypothesis, *i.e.* girls are more likely than boys to think that others will know the answers to the questions. However, if this result is looked at in terms of the particular answerers, we find that the Low IQ boys are more likely than other groups to think that any teacher and any peer will know the answers to the question. Low IQ girls are more likely to think fathers, mothers and friends will know; while High IQ girls are more likely than other groups to think that 'particular teachers' and 'any adults' would know.

This result is not particularly unexpected. To differentiate between potential answerers is not the only knowledge that the children are acquiring! Such differences between boys' and girls' choices appear to follow a pattern expected from a 'sex-typing' process. During the early socialisation of the child, espeially in the preschool years, parents discriminate between the sexes in terms of interests they encourage, toys they buy, books, and many other aspects of the relationship they develop with their children. Such differences towards the sexes encourages the adoption of differing sex roles. It is suggested that girls develop family and person interests and orientation, and boys an object orientation. Such roles are regularly reinforced throughout childhood. Often in schools, such crude distinctions are still made when a girl takes needlework or cookery while a boy takes metalwork or technical drawing. That such large differences in the socialisation of the sexes will influence most aspects of a child's future behaviour is hardly surprising. The above results may be seen as an instance of such a sex difference.

Considering the results concerning who the children would be prepared to choose to answer their questions, we find that twelve year olds are prepared to choose more of the answerers than fourteen year olds and that Low IQ choose more than High IQ. These results are mainly due to the Low IQ twelve year olds choosing more than other groups. This result also fits with the idea that younger Low IQ children are likely to be less discriminating in their choice of answerer. It is particularly interesting to note that the Low IQ twelve year olds are primarily choosing more answerers than other groups because of their greater number of choices of 'any peer', 'any adult' and 'any teacher'.

Looking now at the 'first-choice' data, we find girls are more likely than boys to choose 'friends', 'mothers' and 'fathers' and less likely to choose 'any adult', 'any teacher', 'someone else'. High IQ groups follow a similar pattern to the girls and Low IQ groups perform similarly to the boys.

These results are seen to be not entirely out of line from the exposure-differentiation model, although not all the results are what one would expect. However, if one argues that the children are learning to differentiate both in terms of 'expertise' and 'friendliness', and that younger Low IQ groups are less likely to differentiate on 'expertise', and boys and younger children less likely to differentiate on 'friendliness', then many of the reported results appear to follow such a pattern.

The remaining results that need to be discussed concern *where* the child prefers to ask the teacher his questions, and whether or not the child would like to ask a parent in the presence of the other parent or not. It can be seen that although all children tend to prefer to ask a parent when the other parent is present, fourteen year old Low IQ girls are much less likely than other groups to choose one parent alone. Also it is apparent that fourteen year old girls and twelve year old boys prefer to ask teachers their questions, in class–time, whereas twelve year old girls prefer break-time. However, even among these groups who on balance prefer class-time, there are still large numbers of children who for many questions would prefer break-time.

It seems that children think 'particular teachers', 'mothers' and 'fathers' would know the answers to nearly all of these questions and that the children are prepared to choose these people. It might be argued therefore that children are particularly well served by their environment for having any questions they may have answered. But as a large proportion of the children's time is spent at school and as a large number of children (even if a minority) would like to ask their questions in break-time, it might be that these children (and/or these particular questions) are not given the opportunity for asking that they would most like. This might be true of many schools where perhaps the only chance for a child to see a teacher alone may be to stay behind after class (breaking a norm of his fellow pupils) or to knock at the staff room door (breaking a norm set up by the teachers). It is suggested that children would benefit if provided with an easy to use, officially sanctioned structure, whereby they might consult teachers individually.

8.5 References

Aronson, E. & Colden, B.W. The effect of relevant and irrelevant aspects of communication credibility on opinion change. *J. Personality,* 1962, *30,* 135–146.

Central Advisory Council for Education, England. *Half our future.* London : Her Majesty's Stationery Office, 1963, (J.H. Newsom).

Eysenck, H.J. & Eysenck, S.B.G. *The Eysenck personality inventory.* London : University of London Press Ltd., 1964.

Lindgren, H.C. & Patton, G.M. Attitudes of high school and other teachers toward children and current educational methodology. *Calif. J. Educ. Research,* 1958, 9, 80–85.

Shaw, M.E. & Wright, J.M. *Scales for the measurement of attitudes.* New York : McGraw-Hill, 1967.

APPENDIX I

Questions used in the children's questionnaire

Physical world information

1. Where do swallows go in winter?
2. How far is it to Liverpool?
3. How fast does a stone fall when it is dropped?
4. What chemicals are in cement?

Physical world explanation

5. How is it that cats can see in the dark?
6. Why does gun-powder explode?
7. Why are there volcanoes in Japan and not in England?
8. Why does water change to steam when you heat it?

Social world information

9. Who started the first world war?
10. Who is the Prime Minister of Australia?
11. How many people are there in a jury in Scotland?
12. How much does a nurse/pilot earn?

Social world 'empirical' explanation

13. Why do some people become criminals?
14. Why do Hippies take drugs?
15. Why do Sikh's wear turbans?
16. Why is there trouble between the Catholics and Protestants in N. Ireland?

Social world 'moral' explanation

17. Why is it wrong to beat up people that you do not like?
18. Why is a white South African man allowed to marry a white South African girl but not allowed to marry a black South African girl?
19. Why should we try to send food and clothing to the starving in India?
20. Why is prostitution wrong?

Initial question for procedural purposes

21. Which county in England has the highest temperature in June?

Random order of presentation

21, 5, 1, 13, 2, 17, 14, 9, 10, 6, 18, 3, 15, 11, 7, 16, 19, 4, 20, 12, 8.

APPENDIX II

Example of the Layout of the Children's Questionnaire

1. Which county in England has the highest temperature in June?

			Would Know	Would Choose	First Choice
(a)	Somebody of your own age who you do not know very well.	(a)			
(b)	Somebody of your own age who is a particular friend.	(b)			
(c)	Any adult.	(c)			
(d)	Your mother.	(d)			
(e)	Your father.	(e)			
(f)	Any teacher.	(f)			
(g)	A particular teacher	(g)			
(h)	Somebody else			(h)	

If you were going to ask the teacher you've named, which of the following 2 times would you choose to ask this question in?

(a) Classtime with the rest of the form present.

(b) Breaktime by yourself.

If you were going to ask one of your parents, would you choose to ask

(a) When both parents are together.

(b) When you and one parent are alone.

APPENDIX III

The Teachers' Questionnaire and Covering Letter

Dear

The Schools Council Research Project at Southampton is examining curiosity and questioning in middle and secondary school children. As part of this, Thatcher School has kindly helped us find out something about where, when and of whom children say they would ask questions. As you can imagine they choose to ask teachers as well as parents and friends. Our resources do not permit us to talk with parents, but it would help our inquiries considerably if teachers were to complete some questionnaires intended to canvas views on what you think about education in general and teaching problems in particular. There is an additional set of personal questions.

We are circulating a set to every teacher in the school, but if after you have read it through, you would prefer not to answer the questions, please feel free to put them in a waste-paper basket. Otherwise, we would welcome fully completed questionnaires along with any additional comments you would care to make. The individual replies will be quite confidential to our research workers (hence the stamped addressed envelope), but we shall be pleased to send you a report of our general findings if you would like one.

We do hope you will be able to help.

Yours sincerely,

(C.D. Creed)

	20–24	25–29	30–39	40–49	over 49
1. Age: please tick in appropriate box.	☐	☐	☐	☐	☐

	0–2	3–5	5–10	over 10
2. Number of years teaching: please tick box.	☐	☐	☐	☐

	5,6,7	8,9,10	11–12	13–14	15–16	17–18
3. Please tick the appropriate boxes for those age groups of children that you have taught.	☐	☐	☐	☐	☐	☐

4. Please indicate under the appropriate children's ages all those subjects that you have taught in this school.	11–12	13–14	15–16	17–18
English				
Music				
Maths.				
Geography				
History				
Modern languages				
P.E.				
Art				
R.I.				
Wood, Metalwork				
Business studies				
Science				
Domestic Science				

	Yes	No
5. Have you children of your own? Please tick if 'yes' then how many, what sexes and how old are they.	☐	☐

6. For what age range of children did you train to teach? . . . .

7. For which school subjects, if any, did you train to teach? . . . .

	Yes	No
8. Are you a house tutor in this school at present? If 'yes' then, please name house	☐	☐
9. Are you a form-master/mistress at present? If 'yes' then please name form	☐	☐

10. Please could you list other activities at school that you are involved in other than school-subject teaching? *(e.g.* producing school plays, in charge of a sports team, scouts *etc.).*

(Q1 Opinionaire)

Below are a number of statements about which teachers may have different opinions. As you read through each statement please make a circle around either ++, +, 0, – or –– according to what is appropriate for you. The meaning of these symbols is:

++	Strongly agree
+	Agree
0	Undecided
–	Disagree
––	Strongly disagree

Please answer all the questions.

1. If boys and girls are to do an adequate job of learning in school, their needs for love must be met. ++ + 0 – ––
2. It is appropriate for teachers to require extra work from a pupil who misbehaves in class. = ++ + 0 – ––
3. How a pupil feels about what he learns is as important as what he learns. ++ + 0 –– ––
4. The way to handle a pupil who tells lies is to threaten to punish him. ++ + 0 – ––
5. The older pupil who is not interested in dating members of the opposite sex should be commended. ++ + 0 – ––
6. Education has failed unless it has helped boys and girls to understand and express their own feelings and experiences. ++ + 0+ – ––
7. The classroom experiences that are most helpful to boys and girls are the ones wherein they can express themselves creatively. ++ + 0 – ––
8. All children should be encouraged to aim at the highest academic goals. ++ + 0 – ––
9. Children outgrow early emotional experiences as they do shoes and clothes. ++ + 0 – ––
10. What boys and girls become as adults is more closely related to experiences they have with each other than it is to mastery of specific subject matters. ++ + 0 – ––
11. It is more important for pupils to learn to work together co-operatively than it is for them to learn how to compete. ++ + 0 – ––
12. Some pupils are naturally stubborn. ++ + 0 – ––
13. Pupils should be permitted to disagree with the teacher. ++ + 0 – ––
14. Boys and girls should learn that most of life's problems have several possible solutions and not just one 'correct' one. ++ + 0 – ––

15. The first signs of delinquency in a pupil should be received by a tightening of discipline and more restrictions. ++ + 0 – —

16. The newer methods of education tend to standardize children's behaviour. ++ + 0 – —

17. Most boys and girls who present extreme cases of 'problem behaviour' are doing the best they can to get along with other people. ++ + 0 – —

18. An activity to be educationally valuable should also train reasoning and memory in general. ++ + 0+ – —

19. It is more important for a child to have faith in himself than it is for him to be obedient. ++ + 0 – —

20. Being grouped according to ability damages the self confidence of many boys and girls. ++ + 0 – —

21. Criticism of children by teachers is more effective for obtaining the desired behaviour than criticism of children by others of their own age. ++ + 0 – —

22. All questions a pupil asks should be recognised and considered. ++ + 0 – —

23. The pupil who isn't getting good marks should be told to study harder. ++ + 0 – —

24. Children should not be permitted to talk without permission of the teacher. ++ + 0 – —

25. A pupil who will not do his work should be helped in every way possible. ++ + 0 – —

26. A teacher should lower marks for misconduct in class. ++ + 0 – —

27. A teacher should permit a great deal of latitude in the way he permits boys and girls to address him. ++ + 0 – —

28. It is a good idea to tell a pupil that he can succeed in any type of work if he works hard. ++ + 0 – —

29. Pupils will tolerate errors and even occasional injustices in a teacher who, they feel, likes and understands them. ++ + 0 – —

30. A teacher should accept the deficiencies and shortcomings of a pupil, as well as his good points. ++ + 0 – —

31. Each time a pupil lies his punishment should be increased. ++ + 0 – —

32. Boys and girls can learn proper discipline only if they are given sufficient freedom. ++ + 0 – —

33. If a teacher keeps school conditions exactly the same and gives all pupils an equal opportunity to respond, he has done all he can do. ++ + 0 – ––

34. If a pupil constantly performs for attention, the teacher should see to it that he gets no attention. ++ + 0 – ––

35. Dishonesty is a more serious personality characteristic than unsocialness. ++ + 0 – ––

36. A great deal of misbehaviour and problem behaviour results from fear and guilt. ++ + 0 – ––

37. The teacher's first responsibility in all cases of misconduct is to locate and punish the offender. ++ + 0 – ––

38. It is better for boys and girls to talk about the things that bother them than to try to forget them. ++ + 0 – ––

39. Most pupils need some of the natural meanness taken out of them. ++ + 0 – ––

40. It is more important for boys and girls to be liked and accepted by their friends than it is for them to get along with their teachers. ++ + 0 – ––

41. Teachers should answer children's questions about sex frankly and, if possible, without show of embarrassment. ++ + 0 – ––

42. When a pupil obeys all the rules of the school, one can be sure he is developing moral character. ++ + 0 – ––

43. When a teacher is told something in confidence by a child, he should keep the matter just as confidential as though it were entrusted to him by an adult. ++ + 0 – ––

44. Since a person memorizes best during childhood, that period should be regarded as a time to store up facts for later use. ++ + 0 – ––

45. Pupils should play a very active part in formulating rules for the classroom and the school. ++ + 0 – ––

(Q2 Social Intimacy Scale)

Below are a number of statements about how pupils and teachers might behave in relation to each other.

Each item is answered by circling either ++, +, 0, –, ——. The meaning of these symbols is:

——	Never true for me.
–	Occasionally but very infrequently true for me.
0	Sometimes true for me.
+	Often true for me.
++	True for me almost all of the time.

1. I address both boys and girls by their Christian names. ++ + 0 – ——
2. I encourage pupils to meet me socially outside of school. ++ + 0 – ——
3. When I have complaints about pupils I tell them directly no matter what they are about. ++ + 0 —— ——
4. I expect pupils to be polite to me in all situations. ++ + 0 – ——
5. I expect pupils to feel that they can joke with me. ++ + 0 – ——
6. I do not expect to understand pupils without finding out details of their background and home life. ++ + 0 – ——
7. I expect pupils to ask my opinion when they are making decisions as a group about activities not directly concerned with the classroom (*e.g.* school activities). ++ + 0 – ——
8. If I cannot answer a child's question I tell him so. ++ + 0 – ——
9. I prefer friendship to deference from my pupils. ++ + 0 – ——
10. I trust my pupils. ++ + 0 – ——
11. I expect pupils to be able to ask me for help with activities outside the classroom but inside school. ++ + 0 – ——
12. I ask pupils to lend a hand with activities outside of school. ++ + 0 – ——
13. I expect pupils to be able to ask me for advice on their personal problems. ++ + 0 – ——
14. I expect pupils to address me by my Christian name outside school. ++ + 0 – ——
15. I feel that I can joke with my pupils. ++ + 0 – ——
16. I am polite to pupils in all situations. ++ + 0 – ——
17. I make an effort to meet pupils socially outside of school. ++ + 0 – ——

18. If pupils have complaints about me I expect them to make these known to me. ++ + 0 – —

19. I give pupils information about myself so that they may understand me. ++ + 0 – —

20. I ask for the opinions of pupils before taking decisions that will affect the class as a whole. ++ + 0 – —

21. If a child cannot answer my questions or understand them I expect him to say so. ++ + 0 – —

22. I expect pupils to think of me as a friend as well as a teacher. ++ + 0 – —

23. My pupils trust me. ++ + 0 – —

24. I ask my pupils for help with activities outside of the classroom but inside school (*e.g.* cataloguing the library). ++ + 0 – —

25. Pupils ask me for help with activities outside school. ++ + 0 – —

26. I ask pupils for their comments on some of my personal decisions. ++ + 0 – —

Q3 was the Junior E.P.I. of Eysenck and Eysenck (1964)

(Q4)

The following statements are taken from the writings of various Old Masters : Confucius, Aristotle, Plato, Plutarch, Locke, Wesley, Rousseau, Froebel, Montessor, Pestalozzi, Robert Owen, Issac Watts, Russell and Tolstoy. We would like to know which of the statements you agree or disagree with. Could you circle your choice? Please treat each statement in its own right and don't try to fathom the author. The envelope contains the list of who said what, but we would prefer that this was not opened until after the items have been completed. Knowing who has said something can affect one's evaluation of the remark.

Please circle

1. Children who are forced to learn acquire a loathing for knowledge. Agree ? Disagree
2. To a great extent the character is made or marred before children enter the schoolroom. Agree ? Disagree
3. The pupil should never be told things, he should find them out for himself. Agree ? Disagree
4. The mind of the pupil has to be prepared for the inculcation of good habits, if it is to like and dislike the things it ought. Agree ? Disagree
5. In this century when the doctrine of a just and reasonable liberty is better known, too many of the present youth break all the bonds of nature and duty and run to the wildest degree of looseness. Agree ? Disagree
6. A child must very early in life be taught a lesson which frequently comes too late . . . that exertion is indispensable for the attainment of knowledge. Agree ? Disagree
7. Our educational aim must be to aid the *spontaneous* development of the mental, spiritual and physical personality. Agree ? Disagree
8. At school . . . you see a weary shrinking creature repeating merely with his lips someone else's thoughts in someone else's words with an air of fatigue, fear and listlessness. Agree ? Disagree
9. Desire for knowledge is natural for the young. Agree ? Disagree
10. Each child unconsciously knows and wills what is best for him. Agree ? Disagree
11. Make your education laws strict and your criminal ones may be gentle; but leave youth its liberty and you will have to dig dungeons for age. Agree ? Disagree
12. The curiosity of knowing things has been given to man for a scourge. Agree ? Disagree

Please circle

13. To endure is the first and most necessary lesson a child has to learn. Agree ? Disagree

14. The best overall estimate from intelligence test scores suggest that the inheritable components amount to about 80%. Agree ? Disagree

15. Punishment will never be required and should be avoided as much as giving poison in their food. Agree ? Disagree

16. . . . so the children of the poor should not be generally educated in such a manner as may raise them above the services of a lower station. Agree ? Disagree

17. There is much less danger in satisfying, than in exciting the curiosity of children. Agree ? Disagree

18. It is the nature of many to be amenable to a sense of fear – and to abstain from evil not because of its baseness but because of the penalties it entails. Agree ? Disagree

19. Enforced learning will not stay in the mind. So avoid compulsion and let your children's lessons take the form of play. Agree ? Disagree

20. We adults destroy most of the intellectual and creative capacity of children by the things we do to them or make them do. Agree ? Disagree

21. If for no other reason, we could well afford to throw out most of what we teach in school because the children throw out almost all of it anyway. Agree ? Disagree

22. The memory of children should be trained and exercised, for this is a storehouse of learning. Agree ? Disagree

23. The method of teaching children by a repeated practice . . . till they have got the habit of doing it well . . . has so many advantages. Agree ? Disagree

24. Where love . . . is present in the domestic circle . . . no form of education can fail to succeed. Agree ? Disagree

25. The wise parent should begin to break their will the first moment it appears. Whatever pain it costs, conquer their stubborness. Agree ? Disagree

26. We destroy the capacities of children above all by making them afraid, afraid of not doing what other people want, of not pleasing, of making mistakes, of failing, of being wrong. Agree ? Disagree

(Q5)

The key below gives the authors of the various statements offered. There were a number of things that interested me that might strike you:

1. The apparent contradictions within certain authors.
2. The great age of many new ideas!
3. That the meanings depend so much on the tone of voice in which an utterance is made *e.g.* item 26 can be made to sound sadistic, vitally urgent, loving.
4. J. Holt is a bit over represented. His book 'How children fail' has some terrifying ideas in it if they are true.

KEY

1. B. Russell
2. R. Owen
3. Rousseau
4. Aristotle
5. Isaac Watts
6. Pestalozzi
7. Montessori
8. Tolstoy
9. B. Russell
10. Froebel
11. Ruskin
12. Apocrypha
13. Rousseau
14. Jensen
15. R. Owen
16. Isaac Watts
17. Rousseau
18. Confucius
19. Plato
20. J. Holt
21. J. Holt
22. Plutarch
23. Locke
24. Pestalozzi
25. Wesley
26. J. Holt

APPENDIX IV

Scoring of the teachers' questionnaire

Q1. Opinionaire on Attitudes Towards Education.
Scores are given as 1 (−−), 2 (−), 3 (0), 4 (+), 5 (++) except for negative items (shown with a tick in Q1 in Appendix III), where the scoring is reversed.

Q2. Social Intimacy Scale for Teachers.
Scores are given as 1 (−−), 2 (−), 3 (0), 4 (+), 5 (++). IntA is the sum of the scores on items 1, 3, 8, 9, 10, 12, 15, 16, 17, 19, 20, 24, 26. IntB is the sum of the scores on items 2, 4, 5, 6, 7, 11, 13, 14, 18, 21, 22, 23, 25. IntC is the sum of the absolute differences between the scores on the following pairs of items, 1 and 14; 2 and 17; 3 and 18; 4 and 16; 5 and 15; 6 and 19; 7 and 20; 8 and 21; 9 and 22; 10 and 23; 11 and 24; 12 and 25; 13 and 26.

Q3. Eysenck Personality Inventory.
Neuroticism score – sum of those items marked N (in Q3 Appendix III).
Extraversion score – sum of those items marked E (in Q3 Appendix III).
Lie score – sum of those items marked L (in Q3 Appendix III).

Q4. Educational Guessing Game Scale.
Scores are given as 2 (agree), 1 (?), 0 (Disagree) except those items marked with a tick where the scoring is reversed.
FREE is the sum of the scores for items 1, 2, 7, 9, 10, 11, 19, 20, 24, 26.
TRAIN is the sum of the scores for items 3, 5, 8, 12, 13, 14, 18, 21.
Items 4, 6, 15, 16, 17, 22, 23 and 25 are 'buffer' items and are not scored.

APPENDIX V

Correlation matrix on the scores of the individual items in the Educational Guessing Game Scale. Data collected from first 18 teachers who returned their questionnaires. The items 4, 22, 6, 17, 25 and 16 are not shown here as they correlate very little with any other items.

	24	11	19	20	10	7	2	1	9	26	23	15	5	8	21	3	14	18	12	13
24																				
11	–62																			
19	41	–62																		
20	62	–72	68																	
10	39	–52	36	74																
7	41	–35	43	51	44															
2	52	–27	31	43	23	65														
1	53	–42	22	45	44	54	57													
9	30	–03	18	25	18	50	64	32												
26	50	–54	45	63	33	29	31	29	39											
23	–08	15	–17	06	48	–17	–32	11	–18	–46										
15	29	–37	34	17	–25	05	14	–20	08	21	–56									
5	–27	33	–25	–22	13	–10	–16	–02	–30	–76	64	–29								
8	01	16	–09	–04	–32	–42	–34	–38	10	26	–10	20	–37							
21	–01	08	–31	–02	03	–42	–51	–23	–22	17	23	–19	–33	51						
3	01	06	25	05	–23	–20	–34	–48	10	26	120	54	–37	61	39					
14	–43	25	00	–31	–23	00	21	–07	00	15	–25	–27	14	–31	–30	–31				
18	–16	12	–44	–17	–03	10	26	14	–14	–36	–03	–14	550	–39	–28	–64	40			
12	15	–22	04	–06	–05	–12	–12	12	15	38	–14	04	–41	12	19	31	00	–38		
13	–14	08	–36	–06	16	–20	–07	–28	–25	–10	05	–26	27	–12	14	–40	30	57	–45	

CHAPTER 9 QUESTIONS AS AN AID TO LEARNING (G.V. PROSSER)

9.1 LITERATURE REVIEW
9.1.1 Provided questions in relation to learning
9.1.2 Active questions and discovery learning

9.2 PROJECT STUDIES
9.2.1 Motivational and cognitive interaction
9.2.2 Design problems related to active questions
9.2.3 Summary of research programme
9.2.4 Study I : Nature of materials
9.2.5 Study II : Nature of subject
9.2.6 Study III : Retention interval
9.2.7 Study IV : Inspection time
9.2.8 Study V : Successive presentations – relevant active questions
9.2.9 Study VI : Successive presentations – retention interval
9.2.10 Study VII : Advance preparation and wider context
9.2.11 Study VIII : Questions and other syntactic transformations

9.3 OVERVIEW, IMPLICATIONS AND APPLICATIONS
9.3.1 Problems of procedure and interpretation
9.3.2 Summary of findings
Practical applications : pedagogical

9.4 REFERENCES

CHAPTER 9

QUESTIONS AS AN AID TO LEARNING (G.V. PROSSER)

Editor's Introduction. Questions abound inside the school as well as outside. Teachers ask questions, textbooks ask questions, examinations ask questions, even children ask questions. The schoolday is heavily sprinkled with questions asked for different reasons and to different ends. Here we are not concerned with why questions are asked, but whether or not their occurrence affects learning. Are you more likely to acquire knowledge if gaps in that knowledge have been formulated as questions? Naive expectation would be that if a question has been asked and answered, the answer is more likely to be remembered than if the antecedent question had not been posed, but is this in fact the case? Does a pupil learn more if the knowledge which becomes available to him has done so as a result of him asking questions? Is a pupil more likely to learn and remember something if the teacher has posed the problem as a question or indicated that questions about it will be asked subsequently? Are teachers' questions more or less efficacious than the pupil's own questions as a prelude to learning; that is, can receptive learning be as efficient as discovery or guided discovery learning? The following chapter reviews the literature and reports some investigations around these topics, while setting them in a wider framework.

It should be made clear from the outset that the focus of attention is upon questioning as an independent rather than a dependent or mediating variable. There is no concern with what conditions give rise to more or fewer questions of particular types. There is no concern with how they might be an overt consequence of curiosity, and hence a stimulus to learning. What are perhaps the natural concomitants of questions asked by people who do not know the answers have been treated as confounding complications and stripped away.

Given this pared-down problem of the question as question in relation to learning, we could adopt a crassly empirical approach. Confining our frame of reference to that knowledge which can be represented verbally rather than ikonically or enactively, and assuming that it is desirable or necessary for pupils to acquire some such body of verbally represented knowledge, then have questions a role to play in facilitating its acquisition? If they have, how can they be best exploited? What is the optimal number of questions to use for certain lengths of text? Should the questions be open-ended or closed? What linguistic form should they take and of what type should they be? Where should they be located in any text? At the beginning or the end? Or perhaps distributed in the text? Whose questions promote most learning, those of the teacher or the learner? These are some of the problems that arise, but of course not all. Neither are issues as simple as this.

The answers to the above questions may well be contingent upon the nature and state of the learner, the nature and amount of material to be learned. Younger children may differ from older children, boys from girls, the interested from the uninterested, the clever from the not so clever. Narrative materials may require different strategies from descriptive or explanatory ones.

How all this hangs together presents a formidable array. Too daunting for consideration? Not if one is patient. Too trivial to merit investigation? Only the necessary investigations can answer that question. Irrelevant to the classroom? Hardly so, in view of the vast numbers of questions asked every day. All teachers have attitudes about the value of questions asked by themselves and by pupils. These may be implicit only but the use a teacher actually makes of questions represents a decision, albeit complex one, about their significance. This type of point is not always obvious at first sight, but a little consideration makes one realise that to ask a question is a decision not to do something else, so that implicitly at least one is making a value judgement that this is the best thing to do. In the face of this devious, but nevertheless valid, argument, we are forced to question the value of the question, in spite of the complications mentioned above.

Fortunately we do not have to proceed along the crassly empirical railway lines laid down above. We can see certain ways in which questions might relate to learning and we can make a number of distinctions which may prove useful. This chapter contrasts the backwards and forwards effects of questions. Any backwards effect would operate, for example, when pupils reading or listening to material know they will be asked questions about it subsequently. Although this knowledge is unlikely to increase their curiosity (except about the particular questions?), it may well introduce other incentives reflected in increased motivation to do well. Such sources could be many, from wishes to please the teacher or parents through to snubbing one's peers or siblings or wishes to avoid punishment. It should also be noted that incentives can just as readily increase motivation to do badly or decrease motivation to do well, but for the moment we may assume the world to be cooperative and enthusiastic. While he might wish to do well for its own sake, the incentives referred to above are all extrinsic to the individual. If this is so, we might expect post-study questions generally to affect performance by increasing motivation to do well for reasons extrinsic to the task. This motivation will have two characteristics, one energising, the other directing. The energising component indicates the extra effort to be applied, the directive one to the fact that attention will be focused on relevant activities and distractibility reduced. Within limits, increases in motivation lead to increases in learning even if this is in ways not altogether clear. Concentration on the task in hand is one feature, perhaps increased rate and frequency of rehearsal of material is another. Post-task questions could have other consequences: increased tendencies to be selective in learning with gambling on likely questions, increased anxiety about the subsequent test resulting in distraction *etc.*.

Questions supplied in advance, but which are answered in the succeeding material, are also candidates for motivation arousers. By making explicit the gaps in one's knowledge with an entailing promise to fill them shortly, they should give rise to curiosity. These specific items may arouse a generalised curiosity which should lead to increased probability of learning the materials. However, it is possible that the effects could be specific, arousing curiosity only for the questions actually pre-posed, thereby decreasing the chances of learning other knowledge in the materials. This source of motivation is usually conceived of as being intrinsic to the materials.

While questions posed both before and after material to be learned have a potential similarity as motivating stimuli, this similarity does depend upon the learners having foreknowledge of any post-material questioning. Should they not be given this nor suspect it, then post-questioning can simply be a means of testing what has been learned. If, however, teachers are using questions as aids to learning rather than as a means of testing, the effect of their occurrence may depend upon whether they are located before materials or afterwards but with prior notice that they will be asking them.

In either case the questions are provided by the teacher rather than constructed by the learner. In the case of post-questions they are inevitably provided questions in appearance and in reality. With pre-questions this is not necessarily so. Superficially, the questions are provided by the teacher, but if they are adopted by the learner as his own, then although not actually constructed by him they have in some measure become his. Presumably teachers often hope that the questions they raise when they introduce a topic will be so taken over and integrated into the learner's thinking. However, learners can create their own questions. If they are provided with or already have some knowledge about a topic, they can be asked to formulate their own questions. These 'own' questions, as they are called here, could be thought up after material has been presented; how this would affect learning is difficult to see but it could be investigated. More commonly 'own' questions are posed before the materials.

One might expect, other things being equal (which they of course seldom are), that learners who have devised their own questions should be more highly motivated than those who have had them provided by the teacher. Such a premise would appear to be at the heart of the enthusiasm for the virtues of discovery learner. But is this so? The learner's own questions facilitate learning more than questions provided for him. This contrast is the main focus of the work to be presented.

Questions themselves are contrasted with other possible ways of facilitating learning. With what consequences? The following material should answer!

9.1 Literature Review

In order to focus attention upon the role of questions in learning it will be necessary to ignore a wide range of questioning behaviours. Questions may be used to serve a variety of purposes, such as to test authority, register a protest, evoke embarrassment, prevent uncomfortable silences, express an attitude, make a request or simply as a rhetorical device. Although these actions will have relevance for the teaching situation (sometimes too much?), it will be in their capacity as a means of obtaining information that the special role of questions in relation to learning will be construed.

A distinction may be made between those questions that are asked by pupils and those that are provided by teachers for the pupils. This raises the problem of whether or not these two can be distinguished in any important way. In practice, of course, they can be. In the classroom it is not difficult behaviourally to determine whether the teacher asks the question, or whether the pupil asks the question. The difficulty arises when the nature of the question is considered in this context. The teacher may ask a question, or incorporate it into a learning programme, in the hope that the pupil may make the question his own, or in order that the pupil may rehearse an item of information in some way. Whether questions used in this manner affect the curiosity or some other motivation for learning of pupils, and whether in turn this leads to a more effective grasp of information, may be difficult to establish. Teachers have tended to assume that the questions they direct at their pupils facilitate learning, although doubt has been cast upon the effectiveness of this procedure. In one study (Hoetker, 1968) tape recordings were made of several junior high school English classes over five days. The tapes were transcribed, and it was found that the mean rate of teacher questioning was 1.68 questions per minute overall, with 3.22 questions per minute during periods of all teacher-pupil talk and 5.17 questions per minute of subject matter related talk. Non-theoretical questions came at a faster rate than others and the higher the rate the lower the proportion of correct answers. This does not mean that other benefits did not result from the question-answer exchanges, nor that the teachers were as skilled as they might have been in framing suitable questions. As Kay, Dodd and Sime (1968) pointed out, beginners with programmed instruction are liable to write short statement-question frames of the form, 'Mary had a little lamb . . . What did Mary have?' These 'Mary frames' are not calculated to make much of a demand upon the pupil. Unless such questions occur very near to the related material, they are too general to have any kind of relevance, and they are not likely to serve a useful purpose, apart that is from testing whether pupils are awake or not (see Sanders, 1966 for advice on framing questions in classrooms).

It will be convenient to give the label *'provided questions'* to those questions that are offered to pupils, usually as problems that require solution. This will distinguish them from the questions that are asked by pupils, and which may be conveniently labelled *'active questions'.* The label 'active questions' is intended to suggest the active role of pupils in formulating the questions for themselves.

9.1.1 Studies of Provided Questions in Relation to Learning

Testing and Learning. A number of studies have been undertaken to determine the ways in which provided questions may be used to facilitate the learning and retention of verbal prose material, particularly in connection with programmed instruction. In a series of experiments by Hershberger and his associates (*e.g.* Hershberger and Terry, 1965), it was found that subjects learned more from written passages they were reading, if testing was interpolated rather than just at the end. Although the intention had been to investigate the effects of testing upon the learning process, the fact is that the tests were administered in the form of questions. Following up on this work, Rothkopf (1965) determined to investigate whether questions and specific practice-like effects, or whether they had a shaping effect upon the behaviour of subjects in the learning situation.

Position of Questions. In Rothkopf's experiment, 159 college undergraduates took part. They were exposed to a chapter of prose material taken from the book by Rachel Carson, 'The sea around us'. The chapter was 5,200 words long, and described marine life at the greater ocean depths. For the purpose of the experiment it was divided into seven sections, and two questions were constructed from the material of each of the seven sections, giving fourteen experimental questions in all. The main experimental comparisons were based on a 25-item criterion test, in which none of the experimental questions was repeated. Treatment were as follows:

(i) The two experimental questions were given shortly before *each* section. Subjects wrote their guesses at the answers, and received the correct answers before reading the section;

(ii) As for (i), except that subjects did not receive the correct answers after writing their guesses;

(iii) All experimental questions were given before starting the chapter. Subjects wrote their guesses as to the answers to all questions, and then received the correct answers;

(iv) Immediately after reading each section, subjects wrote answers to the two questions which related to the section. They then received the correct answers;

(v) As for (iv), except that subjects did not receive the correct answers;

(vi) No experimental questions were given. Subjects were instructed to read and study, and told that a test would follow;

(vii) As for (vi), except that subjects were advised to read carefully and slowly.

Rothkopf found that higher learning scores were obtained in the criterion test by groups (iv), (v) and (vii), *viz.* by those subjects who were given the experimental questions immediately *after* reading each section, and by those subjects who had been given no experimental questions but were instructed to read slowly and carefully. Inspection of Rothkopf's data indicates that the treatments effects were largely attributable to the differences between scores obtained by the 'questions after' and the 'questions before' experimental treatments, with 'questions after' being more effective. The results do not support a superiority for questions over control conditions overall. The difference between controls, *viz.* (vi) and (vii), attributed to the giving of special instructions, was not great enough to reach an acceptable level of statistical significance.

It is arguable that the pre-questioning and post-questioning treatments were not strictly comparable. The post-questioning treatment referred subjects to items of information that had already been given. The pre-questioning treatment required subjects to make guesses at information that had not yet been given. Interference from the incorrect guesses might have occurred and offset any heightening of interest.

The Mathemagenic Hypothesis. If, however, questions operate differently depending upon their position, this may be held to support Rothkopf's interpretation of the results as being consistent with his *mathemagenic** hypothesis. According to this hypothesis, subjects engage in certain behaviours when confronted with instructive material. Some of these behaviours are observable, *e.g.* gross postural adjustment of the head and body toward the printed page, and movement of the eyes over the page. Other behaviours are not observable, such as mental rehearsal, the translation of written symbols into internal speech, and the segmentation of such internal speech into phrases, sentences, and other syntactic components. Rothkopf professed reluctance in coining yet another word, but felt that 'mathemagenic' more nearly suggested that thought of behaviours producing learning than a familiar expression such as inspection behaviours. His results could therefore be reformulated as a claim that knowledge that questions would follow reading had the effect of introducing more efficient inspection or mathemagenic behaviours. With further material that followed, the exercise of these skills could help in the acquisition and retention of new information. By definition, mathemagenic behaviours tend to produce learning and, on this view, it is not necessary to make any assumptions regarding the extent to which subjects may be directly motivated to learn.

Decline in Inspection Time. With regard to these mathemagenic behaviours, Rothkopf considered that certain changes might be expected to occur over a period of study. About such changes in reading behaviour he writes, 'Fewer and fewer words are read on each page. Paragraphs and even pages are skipped. Eventually the reader may being to inspect the room about him or become sleepy.' (1965, *p.* 203). Rothkopf and Bisbicos (1967) reported a decline of inspection times with repetition or prolonged reading as one result of their study investigating the selective facilitative effects of interspersed questions. As in the previous 1965 study, it was found that retention was highest when questions were seen *after* reading relevant material. It was also found that variations in the *type* of post-questions could selectively reinforce the retention of question-related material. Asking for names and quantitative measures produced higher recall of that class of phrases. In a further study investigating mathemagenic behaviours, Rothkopf (1968) found that average inspection time per page of verbal prose material declined linearly with repeated exposures. The proportion of correct fill-in responses was found to be an increasing negatively accelerated function of the number of practice exposures.

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*Derivation: *mathema* — that which is learned; *gignesthai* — to be born. The term should not be confused with that special branch of learning called mathematics, although it is derived from the same Greek word.

Retention and Incidental Questions. The effects of the location of provided questions within a piece of biographical material have also been investigated by Frase. In one experiment (1967) 79 college subjects read a passage of biographical prose, excerpted from 'Psychology: The science of mental life', by G.A. Miller (1962).

The following features of the experiment are of interest:

(i) A 2,000-word passage was divided into twenty paragraphs of ten lines, so that material could be presented to subjects in passages of ten, twenty and forty lines, *i.e.* one, two and four paragraphs respectively.

(ii) Two multiple-choice questions (five alternatives) were formulated for each paragraph. These questions required recall of specific factual information such as, number of children in the James family, or a course of study undertaken by William James at a particular time.

(iii) The twenty questions which related to the second half of the paragraphs occurred during the learning session and also in the post-test. These were labelled *retention* questions, and were presented either *before* or *after* the paragraphs to which they referred.

(iv) The other set of twenty questions, relating to the first half of the paragraphs, was used to test for *incidental* learning. As subjects were required to answer both sets of questions during the post-test, the use of the label 'retention' for one of the sets is misleading. Frase clearly wished to emphasize that the need to retain information relating to these questions was made more explicit.

(v) The effects of feedback (or KR, *i.e.* knowledge of results) were also investigated. When answers were given, they immediately followed the questions. When answers were not given, subjects were required to look for answers in the text material.

In summary this was a three-factor design, investigating the effects of position of questions, length of passage, and presentation of knowledge of results. There were two dependent measures, *viz.* learning scores in relation to *retention* and *incidental* questions. Data for the two measures were analysed separately.

Frase found that the effects of position of questions were significant for *incidental* questions. Learning scores were higher when questions were provided *after* the paragraph to which they referred. With regard to *retention* questions, the situation is not quite as clear. Although the effects of all three factors were reported to be significant, showing higher learning scores when questions came *after* the related paragraphs, and indicating that twenty lines was the optimal length of passage, a significant interaction between KR and position of questions occurred. This did not affect the direction of results, favouring higher scores in the presence of KR both when questions preceded and followed paragraphs, but it is doubtful whether the effects of the three factors would have been statistically significant if compared with and tested against this interaction. Furthermore, the scores of a control group, who did not receive any questions, were not included in the analysis. Inspection of means (see Table 9.1 below) indicates that there was no significant difference between the learning scores of controls and the scores of subjects who had received questions. With *incidental* questions, the controls obtained scores intermediate between those of pre-questions and post-questions subjects.

Table 9.1. Mean Percentages of Correct Answers to Questions in Studies of Rothkopf and Frase

		LBA	B	BA	A	AA	Control
Rothkopf	'Retention'	78	65	78	63	82	29
	Incidental	36	30	35	43	40	33
Frase	'Retention'	85	61	87	79	91	68
	Incidental	52	54	53	73	70	61

LBA – All questions and answers given, then Ss read passages. (Frase, forty lines).
B – Questions given before *each* paragraph.
BA – Questions and answers given before each paragraph
A – Questions given after each paragraph
AA – Questions and answers given after each paragraph.
Control Read prose passages without receiving questions.

Discussing these results, Frase argued that questions received *after* the passage could either help in the retention of related information given in that passage, or they could have some effect on the orientation of subjects towards subsequent passages. He doubted whether questions would have a retroactive facilitating effect, particularly in view of the findings of Ausubel, Schpoont and Cukier (1957) that asking subjects to remember course material *after* they had read the material did not facilitate retention. For this reason, Frase favoured an interpretation consistent with Rothkopf's mathemagenic hypothesis.

Contiguity of Questions and Texts. One way of interpreting the difference in favour of post-questions rather than pre-questions is to say that the pre-questions have an interfering effect on mathemagenic behaviours. Perhaps they encourage subjects to concentrate on those parts of the text which appear to relate directly to the questions. If pre-questions interact with the text in this way, restricting the stimuli that are responded to, then it might be hypothesised that the closer individual questions are placed to answers given in the material, the sharper they selective effects.

In order to ascertain the relevance of contiguity of questions and related content, Frase undertook two studies (1968a, 1968b). In the first of these, again using material from the textbook in introductory psychology, and working with college students, he placed questions before or after every ten, twenty, forty or fifty sentences. All subjects were given the same complete set of questions, but depending upon their spacing within the text, questions were presented in groups of one, two, four or five. It was found that retention of the incidental material decreased substantially for the pre-questions group when questions were presented with greatest frequency. When questions occurred infrequently, as in the case when they were presented before or after every fifty sentences, there were no differences in retention between the pre- and post-questions groups. In the second study, questions were presented either before or after the paragraphs every ten or twenty sentences, and similar results were found. Frase doubted whether the post-questions acted as discriminative stimuli for the arousal of mathemagenic skill since there was a difference in favour of post- over pre-questioning on the very first paragraph.

Frase did not use a control group in these two studies, but his results are consistent with the possibility that pre-questioning, in the case of the first paragraph at least, might have led to pro-active interference. A control group was used in a study by Frase, Patrick and Schumer (1970), but the effects of one type of extrinsic incentive were also investigated in their study. Pre-questions were found to have the effect of depressing incidental learning well below control group scores. In a further investigation of this particular inhibiting effect of pre-questions, Patrick (1968) hypothesised that rehearsal of the pre-questions should make the questions and their guessed answers available over a longer period, and carry the inhibiting effect forward. His prediction was confirmed for pre-questions groups who had been instructed to write out the questions.

Extrinsic Incentives. While investigating the effects of pre-questions Frase, Patrick and Schumer (1970) were also concerned with the effects of incentives. 270 undergraduates were promised no, three or ten cents for each correct answer on a test given immediately after reading each of twenty paragraphs of biographical text. All except control subjects viewed twenty out of forty questions derived from the paragraphs under two conditions: either with one question before or after each paragraph, or with groups of five before or after each group of five paragraphs. Learning was found to be contingent upon how much money subjects were offered for obtaining correct answers. The advantage of post- over pre-questions which had been reported in previous studies diminished under the high incentive condition. The writers concluded that this was not a result of any deficiency in the learning consequences of post-questions, but to improved performance by the pre-questions and control groups as incentive increased.

Delayed Retention. In his study investigating the effects of rehearsing pre-questions, Patrick (1968) administered multiple-choice tests immediately after reading a passage, and one week later. He found that although, as might be expected, retention on the delayed test was lower, the effects of the questions remained the same.

The effect of pre-questions on delayed retention of question-relevant and question-irrelevant prose content was investigated in a study undertaken by Peeck (1970). He felt the need to control reading time, as it was difficult to judge whether better results in retention were due to extended inspection or to a more attentive, active reading process. A 3,000-word prose passage about Greece was presented to seventy two undergraduate students for a fixed period of time. One group was first required to guess answers to a list of pre-questions. They indicated their guesses by marking one of a number of alternatives. Another group simply read the pre-questions. One control group was allowed as much extra time for studying as the two experimental groups were given to deal with the pre-questions. Another control group was not given extended study time. Both pre-questions groups showed better retention over seven days of question-*relevant* prose content than controls, but inferior delayed retention of question-*irrelevant* information. The question-*irrelevant* test roughly corresponds to Frase's *incidental* questions test, so that Peeck's findings may be said to have repeated Frase's findings for the pre-questions subjects. For the immediate retention test, no distinction was made between question-relevant and question-irrelevant information, and the control group which had been given extended time obtained significantly higher scores than the pre-questions group that had not been required to guess the answers. Differences between the two pre-questions groups were not statistically significant either in the short or long term. Commenting on this, Peeck writes, 'Thus it seems that as far as retention is concerned it does not make much difference whether one reads the questions without committing oneself by marking an alternative or one actually answers the pre-questions.' (1970, *p.* 244). The effectiveness of the reading control treatment, particularly in the case of question-irrelevant information retention, may be attributed to the fact that in the experimental situation, subjects were prepared to conform to an assumed requirement that the learning task be taken seriously. It needs to be remembered that these were university students; and they may be expected to have evolved their own strategies for dealing with material that they are required to read and learn. With regard to younger school pupils, it is possible that this would only apply to the most able.

Inhibitory Effect of Pre-questions. The main difficulty with the provided questions experiments would appear to be that the questions do not arise from the passages being studied, but are really foci for rehearsing particular points within the passages. Some points are overlearned, while others are neglected. It is for this reason that pre-questions appear to have been unsatisfactory. There could be lowered incidental learning without a corresponding increase in relevant learning. Provided questions need to do more than offer items of information as statements in interrogative form if they are to be useful. It is to the extent that these questions call for answers that they may be said to contribute towards the simulation of a genuine question-asking situation. It is not quite clear to what extent experimenters' requirements that subjects answer, or make a guess at answering, pre-questions will have depressed learning and retention scores. Rothkopf (1965) instructed subjects to write their guesses. Frase, Patrick and Schumer (1970) required subjects to view questions, while Frase (1967) either supplied answers or instructed subjects to look for answers within the text material. It is arguable that any curiosity which may have been aroused by pre-questions was offset by the experimental requirement that subjects make a guess at the answers. Patrick's (1968) design may have gone part of the way to meeting this objection. He required one group to write out questions, another group to write out what they thought were the correct answers, and two groups to read the questions. There was depressed *incidental* learning for the group writing out questions, and this was interpreted as indicating that writing pre-questions was the most effective way of rehearsing them and of carrying forward their inhibitory effects. In view of Peeck's (1970) failure to find any difference between the pre-questions *guess* and *no guess* groups, Patrick's interpretation may be tenable.

Summary of Results with Provided Questions. The chief points that emerge from studies investigating provided questions are as follows:—

(i) Subjects learned more from written passages if they were periodically tested on the material they were reading. (Hershberger *et al.*).

(ii) *Post*-questions were more likely than *pre*-questions to facilitate learning, particularly *incidental* learning. (Rothkopf, Rothkopf & Bisbicos, Frase).

(iii) When subjects were instructed to read and study carefully, or when given extended study time, they could obtain *incidental* learning scores as high as, or even higher than, those obtained by subjects receiving experimental questions. (Rothkopf, Frase, Peeck).

(iv) Average inspection time per page of verbal material declined linearly with repeated exposures. (Rothkopf & Bisbicos).

(v) *Pre*-questions appeared to have a pro-active interference effect, particularly if they occurred frequently. (Frase).

(vi) The pro-active interference effect of *pre*-questions, and possibly their guessed answers, could be sustained over a period of seven days if subjects rehearsed the questions by writing them. (Patrick).

(vii) The pro-active interference effect of *pre*-questions could be depressed by the use of *extrinsic* incentive. (Frase, Patrick & Schumer).

(viii) In the long term, subjects given *pre*-questions scored higher than controls in test on question-*relevant* as opposed to question-*irrelevant* or incidental information. (Peeck).

9.1.2 Active Questions and Discovery Learning

Studies investigating the active question as an independent variable appear to be few, largely because of the practical difficulty involved in eliciting questions. Procedures adopted to this end are likely to have their own effects upon learning and retention, so that it becomes difficult to separate the effects of questions from those of the procedures adopted to elicit the questions.

Fahey (1942b) cites a number of early educational texts which make the assumption that active questions facilitate learning, *e.g.* Dewey (1916), Woodworth (1922), Hasler and Smith (1930), Symonds (1936), Umstattd (1937), and Wesley (1937). A quotation from Wesley bears repetition, 'The question is a natural expression of the thinking mind. The teacher who does not receive a number of unsolicited questions should seriously examine his methods.' (*id. p.* 489). Teachers will justifiably have doubts regarding the truth of such a generalization; but the assumption that active questions facilitate learning is also one that needs to be tested.

Effectiveness of Children's Questions : Early Studies. Among early attempts at assessing the effectiveness of children's questions were those of Finley (1921) and Helseth (1926). Finley encouraged children to ask questions by bringing a salamander into the classroom. He recorded a total of over 8,000 questions from 1,713 children. In a test based on the salamander as topic, he found that children remembered best those points about which they had asked the most questions. The difficulty in interpreting this study solely in terms of the relationships between questioning and learning is that the points about which children asked most questions were possibly the points most likely to arouse curiosity, and most likely to be remembered for that reason.

Helseth encouraged sixteen of her pupils to use questions, and found that their ability to find questions that could be asked increased. These pupils were also found to be above the norms on U.S. standardized history tests. This is an example of the kind of study which confounds the effects of the eliciting process with the effects of the questions. Intervention programmes, particularly with such a small sample of subjects, are almost certainly in danger of contamination by Hawthorne effects (*i.e.* inflation of scores, attributable to interest shown in the subjects by experimenters, and found to have occurred in experiments at the Hawthorne works, Chicago. See *e.g.* Homans, 1951, for fuller discussion).

Inducing Question-Asking Behaviour. More recently, Blank and Covington (1965) developed an auto-instructional programme, and were successful in their attempt to induce question-asking behaviour by this means. They also found that their subjects received higher scores on a science achievement test, and were rated superior to two control groups in terms of participation in class discussions. Problems in the science achievement test did not deal directly with any of the science materials or concepts presented in the programme.

In order to ensure that conditions for experimentals and controls would be the same, this means that, although there would appear to be evidence for *general* facilitative effects, possibilities of *specific* facilitative effects have not been examined. The teacher ratings, though suggestive, may have been contaminated by awareness of the experimental situation.

Discovery and Reception Learning. It is arguable that active questions typically occur in discovery situations. The active question appears to be an example of spontaneous behaviour by an active student; and in the discovery situation the behaviour of subjects who are finding out for themselves is supposed to be marked by spontaneous activity. Attempts have been made to see what goes on in the discovery situation, particularly in view of Ausubel's (*e.g.* 1963) call to put the reception learning versus discovery learning dichotomy into proper perspective. Ausubel has emphasised that both discovery learning and reception learning *can* be meaningful. It is not correct to assume that rote learning and reception learning are indistinguishable. Reception learning may be rote or meaningful. The chief point about it is that the entire content of what is to be learned is presented to the learner in its final form. The learner's task is to internalize the material so that it is available and reproducible at some future time. In the discovery learning situation the principal content of what is to be learned must be independently discovered by the learner. Discovery learning in this sense rarely occurs at the classroom level. There is usually some intermediate position, more properly referred to as 'guided discovery'. Ausubel held that while discovery learning is an appropriate procedure for solving everyday problems of living, large bodies of subject matter are most easily acquired through reception learning. And educational and other establishments frequently require their members to absorb large bodies of verbally mediated knowledge.

Verbal Reception and Guided Discovery. In support of this view, a recent study by Rowell, Simon and Wiseman (1969) may be cited. They devised an artificial schema, the basic elements of which were symbols, each of which was associated with a separate meaning. The symbols included such figures as a square, a circle, a triangle, an arrow and a star, and these were associated with the meanings 'container', 'cloth', 'making', 'moving', and 'heat', respectively. These symbols could be combined according to specific rules in order to generate new patterns of meaning, *e.g.* a square combined with an arrow would suggest the association of the two meanings 'container' and 'moving' to generate the new meaning 'vehicle'. The subjects, who were university students, had the task of learning to understand and use the schema. Two methods of presentation were used, *viz.* verbal reception and guided discovery. The verbal reception subjects were given a carefully prepared lecture, examples of combinations of symbols, and opportunity to practise. The guided discovery subjects were given examples of combinations and, after a starting point had been determined upon in consultation with the experimenter, went on to discover the meanings of the symbols, using the technique of question-answer discussion among themselves. The results of a post-test given ten weeks later showed the verbal reception method of presentation was superior to guided discovery. Mean scores (percentages) were 75.9 and 65.6 respectively.

In such studies, the question is a dependent variable insofar as it is elicited by the discovery situation and certain experimental procedures. To the extent that the questioning procedure is held to produce certain effects, such as discovering rules or meanings, the question acts as the independent variable. In the Rowell, Simon and Wiseman study, it would not be possible to attribute the comparative ineffectiveness of the guided discovery procedure to the questioning that went on in the question-answer discussion. As in the case of intervention programmes aimed at eliciting questions, the effects of the questions themselves are confounded with the effects of the procedure used to elicit them.

Motivational and Cognitive Factors. Proponents of discovery learning tend to stress motivational as against cognitive factors. Kagan (1966) regarded motivation as the catalyst in creating new cognitive structures, or patterns of thinking and the organization of an individual's knowledge; and in putting the case for discovery procedures, argued that subjects are more fully involved, their attention is occupied, and they derive benefit from an appreciation of the value of the task. Freed from submissiveness, they are supported by the expectation of solving the problem. However, as Kagan acknowledges, young children may not be able to appreciate the joys of problem-solving; and many pupils are not able to sustain effort without the prospect of immediate reward. Bruner (1961, 1966) urged that discovery procedures tend to foster an interest in the activity itself, rather than in the rewards which may follow from learning. He argued that if such procedures are used, pupils should develop the ability to approach problems in ways that are more likely to lead to a solution.

An assessment of this particular issue need not be attempted in considering the role of active questions (For a full discussion and review of the literature, see Shulman and Keisler, 1966), but it may be argued that whatever procedures are adopted, pupils are more likely to derive benefit from them, if they are led to perceive that the learning process in which they are involved has *relevance* for them. Questions are more likely to be asked if pupils see that they need to be asked, *i.e.* answers to them are needed. Pupils are more likely to ask for information if they feel the need for information. This makes the task of isolating the effects of active questions extremely difficult. Facilitative effects on learning by pupils who ask for information may as easily be attributed to the fact that they feel the need for information as to the asking process.

Summary of Results with Active Questions. The chief points that emerge from studies investigating active questions are:

(i) Children remembered best those points about which they asked the most questions. (Finley).

(ii) Question-asking behaviour could be induced in children; and pupils who were encouraged to ask questions obtained higher scores than other pupils in tests of scholastic achievement. (Blank, Covington and Helseth).

(iii) A question-answer discussion technique was less efficient than a carefully prepared lecture in enabling university students to learn and use an artificial schema of symbols and meanings. (Rowell, Simon and Wiseman).

Briefly recapitulating the findings of both provided and active questions:

Provided questions

Learning scores obtained by subjects given *pre*-questions were lower than those obtained by subjects given *post*-questions and *controls,* who were not given experimental questions, in tests based on *incidental* or question-*irrelevant* information, but not if subjects were given *extrinsic* incentives, and not in the *long*-term in tests based on question-*relevant* information.

Active questions

Question-asking behaviour could be induced in children who remembered best those points about which they asked most questions, and obtained improved scores in tests of scholastic achievement; but a question-answer technique was less efficient than a lecture in enabling university students to learn and use an artificial schema.

In explanation of the findings with regard to provided questions, it is possible that when subjects are given questions before related material, they have to decide what strategies to use in studying the material. They may consider whether or not to concentrate their attention upon items of information that are clearly and directly related to the questions. Much will depend upon the conception they have of the task with which they are faced. Led to anticipate a test at the end of the study period, they may make their own guesses regarding the nature of that test. Subjects such as psychology undergraduates may be supposed to have had some experience of performing in tests, and they could well imagine that the experimenters were aiming to trap them. In this case they might pay special attention to items of information not relating to the pre-questions. On the other hand, they may not care very much what is likely to happen in the test, yet find that in spite of a general lack of motivation, they cannot help noticing items of information relating to the pre-questions.

Considered from the point of view of intrinsic and extrinsic motivation, the situation may be represented as follows: high intrinsic motivation will be motivation for learning the passage. High extrinsic motivation may be motivation for a good test performance or for some reward associated with this. In both situations, subjects will pay as much attention to incidental as to question-relevant information, and in such cases little difference might be expected between scores obtained under pre- and post-questions conditions. Frase, Patrick and Schumer's findings in the incentive experiment are consistent with this. In the low motivation condition, subjects probably tend to follow the easiest way out, and simply use the pre-questions as a means of rehearsing specific items of information. The rest is neglected.

With regard to active questions, it has already been pointed out that difficulty is experienced when attempting to separate the effects of active questions upon learning from the effects of the procedure that is adopted in order to elicit the questions. It seems likely that teachers who encourage their pupils to ask questions are good teachers in other ways as well, in that they aim to arouse the interest and active participation of their pupils in the learning process. This does not mean that they are necessarily the most efficient teachers. It could be argued that however desirable from the point of view of the classroom as a social situation, questions asked by pupils are really a waste of time. Rowell, Simon and Wiseman's findings appear to suggest this, but it needs to be borne in mind that their subjects were university students for whom the problem of arousing interest is probably less acute than for lower ability adolescents in a comprehensive school.

9.2 Project Studies : Active and Provided Questions

9.2.1 Motivational and Cognitive Interaction

Motivational variables appear to have relevance for both provided and active questions, and it was felt that some practical purpose might be served by exploring the possibility of an interaction between motivational and cognitive factors. Ausubel (*e.g.* 1963) understands cognitive structure to be 'a given individual's organization of knowledge', or more simply, 'what the learner already knows' (1968 *p.* vi); and in the following project studies, the main emphasis is placed upon investigation of motivation and cognitive structure in relation to learning based on *active* questions, in view of the relative paucity of controlled experimental studies in this field and their implications for guided discovery methods.

9.2.2 Design Problems Related to Active Questions

In experiments investigating the usefulness of provided questions, the structure of the questioning and learning situation can be more closely brought under the control of the experimenter; and in the Rothkopf and Frase studies, the post-tests were directly linked to particular sections of the written prose to which subjects were exposed. On the other hand, the effects of *active* questions, in, for example, Blank and Covington's (1965) study were of a general rather than a specific nature. Subjects were held to have achieved a higher level of performance in tasks not directly related to the experimental situation itself, in consequence of instruction in question-asking behaviour. For this reason, it was felt that in order to assess the facilitative effects of questioning, the experimental design should permit of a definite association between materials used to generate questions, and materials serving as a basis for tests of learning and retention. In this search for closer experimental control, it is inevitable that some of the spontaneity that might be thought typical of the question-asking situation must be lost.

9.2.3 Summary of Research Programme

The research programme, giving some indication of the problems investigated in the course of particular studies, is summarized below. Full details may be found in Prosser (1971).

I. Nature of Material

> Do the effects of difficulty level of material differ for *active* and *provided* questions?
>
> Are the effects of difficulty level of material the same for *high* and *low* ability subjects, for *boys* and *girls*?
>
> Are subjects more likely to benefit from questions if faced with a realistic challenge to their competence?

II. Nature of Subjects

> Is there an optimum level of difficulty at which questions, particularly *active* questions, are most helpful?

III. Retention Interval

> Do the *long*-term effects of questions differ from their *short*-term effects?
>
> Are the effects of retention interval the same for both *active* and *provided* questions?

IV. Inspection Time

> Will question-asking be more useful if time spent inspecting the stimulus material is not determined by the experimenter but by the subjects themselves?

V. Successive Presentations : Relevant Active Questions

> Must subjects feel that the questions they ask have a definite part to play in the learning process before deriving benefit from them?
>
> Do the effects of questions on learning and retention remain constant over a number of prose passages presented successively?
>
> If there is a decline in inspection and study time over a series of presentations, do *active* questions have a modifying effect upon this?

VI. Successive Presentations : Retention Interval

> When subjects are exposed to a number of prose passages in succession, do the long-term effects of *active* questions particularly relevant active questions, differ from those of *provided* questions?

VII. Advance Preparation and Wider Context

> Do questions make a contribution towards a meaningful learning that may not otherwise be made if subjects are given a carefully structured advance preparation?

VIII. Questions and Transformations

> If benefit is derived from questions, is this because in order to formulate, read or answer questions, subjects must perform grammatical transformations (*viz.* from and into the interrogative form); or are there other reasons?

Initial investigations had indicated that results would probably not be independent of such factors as sex and ability of subjects, and nature of materials used: the headings I to VIII under which the programme of project studies is summarized, may therefore be regarded as representing sources of variance.

While investigating provided questions, Rothkopf, Frase and others were able to look at the effects of questions upon relevant and incidental learning. In the studies investigating active questions, this particular dichotomy appears to be less meaningful when considered from the point of view of the experimenter. When subjects ask their own questions, they are largely responsible for determining what is relevant for them. This may or may not coincide with the experimenter's opinion. The problem is recognized in Study VII, where the effects of providing a wider context are considered.

9.2.4 Study I : Nature of Materials

A piece of prose material may be more or less difficult, depending upon such characteristics as its length, the amount of information it contains and the nature and complexity of the topic with which it deals. The extent to which a passage offers difficulty to any given subject will also, of course, depend upon that subject's ability, knowledge and experience. Subjects taking part in the experiments investigating provided questions have usually been of above average intellectual capacity, Rothkopf (1968) used high school students from the eleventh and twelfth grades as well as university undergraduates. Frase (1968) and Peeck (1970) used students specialising in psychology. Frase (1967) and Frase, Patrick and Schumer (1970) used university students specialising in educational psychology. It is possible, however, that ability level has a significant part to play in determining a subject's assessment of the challenge presented to his competence. If material is difficult, not only will the subject have a greater need for any assistance that questions may be supposed to give, but he will be more likely to consider that such assistance is desirable. In such a case, *provided* questions may be the means of organizing the material for effective incorporation into the more or less elaborate system of concepts and sub-concepts already possessed by the subject, and which may be referred to as his cognitive structure. More simply, provided questions may make it easier for subjects to relate new information to what they already know. *Pre*-questions may offer a pre-structure analogous to Ausubel's (1963) 'advance organizer'. *Post*-questions may offer cues for the rehearsal of salient points. The *active* questions of school-children will probably be less expertly formulated than the *provided* questions of an experimenter: but if pupils feel that there is point in asking questions, they might be expected to derive special benefit from their own questions since the pattern of rehearsal of points will be one that is determined by a genuine interaction of the pupils with the prose material.

Procedure. Study I was carried out in two stages. In the first part of the experiment, a passage of 'easy' biographical prose was presented to forty seven boys and girls, aged thirteen to fourteen years, and taken from the upper two of five streams corresponding to ability and attainment in a neighbourhood comprehensive school. In the second part of the experiment, a passage of 'difficult' prose was presented to thirty of the boys and girls involved in the first part.

The 'easy' passage was specially prepared; of 300 words in length; it related to the life of a young soldier called Jim. The 'difficult' prose was a 450 word passage taken from the life of Robert E. Lee, in 'Men of America' by Lionel Elvin, London : Pelican Books, 1941. This had not so far formed part of the class curriculum, and subjects denied knowledge of the topic, apart from having at some time heard of the American Civil War in general terms. This would have given them no advantage when considering the details in this one man's life which were now being studied. Apart from the fact that the 'difficult' passage was longer, it contained more information, and was written in a style that required the use of a more advanced vocabulary. In a pilot study, learning scores obtained on the 'easy' passage were considerably higher than those obtained on the 'difficult' passage, irrespective of treatment conditions; and this appeared to validate the notion of difficulty for this experiment.

In order to compare the performance of subjects at different ability levels, a Mill Hill vocabulary test raw score of 43, approximating the fiftieth percentile (*i.e.* for the general population), was taken as a convenient cut-off point for upper and lower verbal ability groups. Since all subjects were from the upper streams, there were no very low ability pupils in the study. The terms 'high' and 'low' will be used in reporting this experiment, but should of course be treated as relative.

For each part of the experiment a non-specific version of the prose passage was prepared. Pronouns were used instead of names; adjectival or adverbial qualities were not specified; and events were referred to in general and indefinite terms.

e.g.	Full Passage:	'The sea was rough, and their boats were too small and frail'.
	Non-specific passage:	'Conditions were unsuitable, and equipment poor'.

The gaps in information were expected to elicit questions, and where questions were provided by the experimenter, they related to these gaps. In the above example, the provided questions were:

'What were the conditions?'
'What was the equipment?'
'In what way was the equipment poor?'

Subjects were assigned at random to five groups; three experimental and two controls. Study tasks and timing were as follows:

<table>
<tr><th>Treatments</th><th colspan="8">Time in Minutes</th></tr>
<tr><th>QUESTIONS</th><th>0</th><th>5</th><th>10</th><th>15</th><th>20</th><th>25</th><th>30</th><th>35</th></tr>
<tr><td>Active</td><td rowspan="3">Read Non-Specific Passage</td><td colspan="3">Write Questions</td><td colspan="4" rowspan="4">Read Full Passage</td></tr>
<tr><td>Provided</td><td colspan="3">Read Questions</td></tr>
<tr><td>Active and Provided</td><td colspan="2">Write ?s</td><td>Read ?s</td></tr>
<tr><td>READING
Split</td><td colspan="4">Read Non-Specific Passage</td></tr>
<tr><td>Continuous</td><td colspan="8">Read Full Passage</td></tr>
</table>

Immediately following the study and learning period, all subjects were given the post-test. A modification of Cloze procedure was used. 25 sentences were devised, from each of which two words were deleted. Words were selected for high information content. Transformations, particularly from active to passive voice, and vice versa, were frequently used. Blanks in the test sentences were indicated by dotted lines of even length.

e.g. Full Passage: The intervening six months had been a time of vigorous preparation.

Test Sentence: Getting . . . . had taken . . . . months.

Responses in the post-test were classified as 'right', 'wrong/blank', or 'doubtful'. To determine a subject's score, only those 'right' responses that occurred in the same sentence as a 'right' or 'doubtful' response were counted. Semantic sense and grammatical appropriateness were sufficient to count as correct.

Post-test scores were subjected to analysis of variance, the main variables being sex, verbal ability, and difficulty of material; all in relation to the five treatments. Means were compared and tested against the error variance term.

Results. Results may be summarized as follows:—

Easy Prose

Girls:	Questions (particularly provided questions) gave higher scores than Reading.
Boys:	Reading gave higher scores than Questions (particularly active questions).
High ability:	Reading gave higher scores than Questions.
Low ability:	No difference between Reading and Questions.

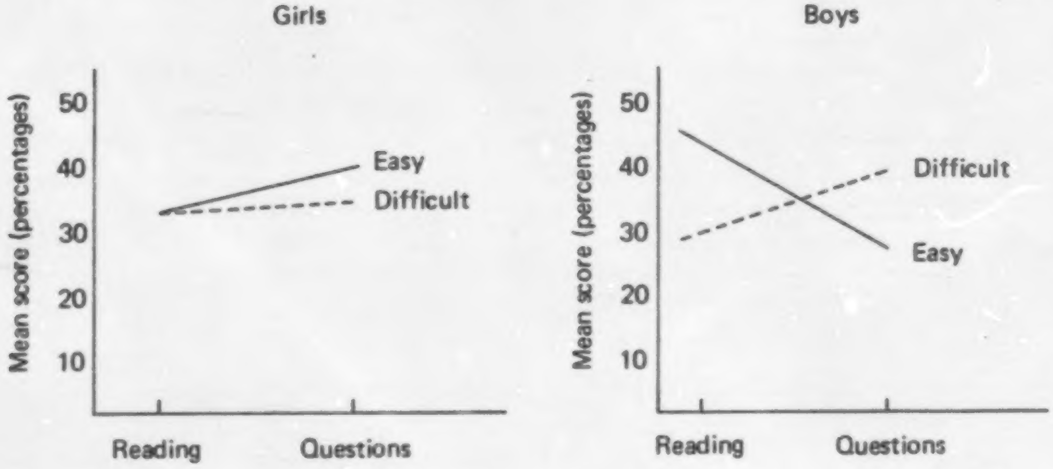
Difficult Prose

Girls:	No difference between Reading and Questions.
Boys:	Questions (particularly active questions) gave higher scores than Reading.
High Ability:	No difference between Reading and Questions.
Low Ability:	Questions gave higher scores than Reading.

Table 9.2 Mean Percentage Scores for Questions and Reading Treatments

	Reading	Questions	Questions treatments differing significantly from Reading * p <.05 ** p <.01
Easy Prose			
Girls	33	40	Provided higher (55%)*
Boys	46	29	Active lower (16%)*
Low Ability	23	25	
High Ability	61	48	Active and Provided lower (34%)**
Difficult Prose			
Girls	33	36	
Boys	31	39	Active higher (58%)*
Low Ability	33	41	Active higher (55%)*
High Ability	30	34	

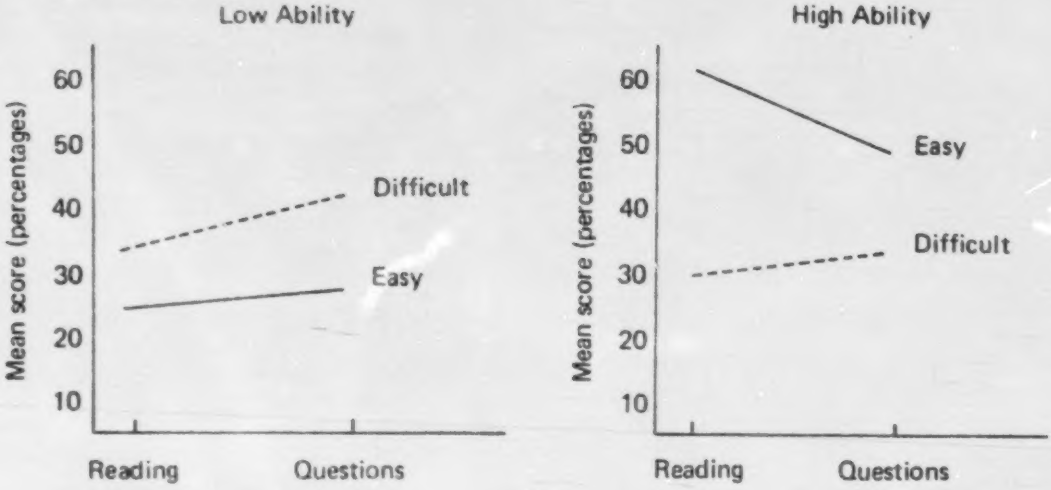
Fig. 9.1 Effects of Treatments, Sex, Verbal Ability and Prose Difficulty; and Interactions between these Factors



Treatments effects for girls are the same with both easy and difficult prose

Treatments effects for boys are reversed for easy and difficult prose. (Interaction effect significant at the 1% level)

Fig. 9.1 – continued



Low Ability subjects obtain higher scores with the difficult prose, and the effects of treatments are almost the same for both easy and difficult prose.

High ability subjects obtain higher scores with easy prose, and the effects of treatments are reversed for easy and difficult prose. (Interaction effect significant at the 5% level)

Discussion. Sex Differences. It would appear from these results that the role of both active and provided questions in the learning process is complicated by factors arising from individual differences associated with both sex and verbal ability. Differential advantage had been expected for active questions in the case where more difficult prose material had been used and where pupils may be presumed to have considered that there was point in asking questions. Results appear to have been consistent with this, but not wholly explicable in this way.

Interest in the sex differences centres on the boys for whom prose difficulty reverses the effects of experimental treatments. Active questioning, which had proved the least helpful treatment when boys were presented with easy prose, became the most helpful treatment when the prose was difficult. In the case of girls, however, the direction of effects fairly consistently favoured questions, even when failing to reach an acceptable level of significance.

By way of explanation of this result, it may be suggested that whereas boys are possibly task oriented, girls are situation oriented. In other words, boys may be more responsive to the pacing of a particular task; if the task is too easy, they will slacken their efforts. Girls, on the other hand, may be prepared to sustain a level of performance more closely related to factors in the experimental situation itself, *e.g.* teacher-pupil and experimenter-subject relationships in the classroom as a social situation. Girls tend to be more cooperative, and to take an appointed task more seriously.

There is considerable evidence in the literature to support the familiar stereotypes of female passivity as well as the male readiness to respond to a realistic challenge. Moriarty (1961) found that young girls tended to adapt more quickly to a new situation, orienting to instructions and tasks; but that with increase in task difficulty, this sex difference was reversed. Crandall and Robson (1960) found that in the six to eight years age group, boys chose to do a task that they had not been allowed to complete, more frequently than girls. Working with college students, McClelland (1953) found that whereas under relaxed conditions, women's need for achievement was greater than men's, but when subjects believed that they were competing on an academic text, there was a sharp rise in the men's need for achievement. It was when subjects competed for social approval that the women's sense of need increased. Social factors were held by Smock and Holt (1962) to account for sex differences in response to various forms of novel stimuli. Four sets of pictures representing types of perceptual conflict were presented to boys and girls aged seven to eight years. The children could elect to look at each picture as many times as they wished. When presented with these picture materials offering stimulus complexity, incongruity, and meaningfulness of the sequence of information, the boys were more curious. Girls, however, had a tendency to respond to the absence of environmental structure, *i.e.* to seek for an interpretation of new stimuli in terms of existing cognitive structures. This could explain the results obtained in the present study. Although immediately challenged to activity by the 'easy' prose girls were more rigid in their approach to the 'difficult' prose.

Verbal Ability. With regard to differences attributable to verbal ability, it would appear that with the easy prose, high ability subjects found that the overt response, *i.e.* of writing questions or answers to questions, was an unnecessary employment of time. The task was too easy to offer them any kind of challenge. They found the questions irrelevant and unhelpful. Low ability subjects took the task more seriously, particularly in the case of difficult prose material.

Summary. In the course of this study, three research problems were considered, *viz.*

(i) Do the effects of difficulty of material differ for *active* and *provided* questions?

(ii) Are the effects of difficulty of material the same for *high* and *low* ability subjects, for *boys* and *girls*?

(iii) Are subjects more likely to benefit from questions if faced with a realistic challenge to their competence?

Results do not show a clear difference between the effects of active and provided questions, but it is noteworthy that where difficulty of material reversed the effects of treatments for boys, the swing from least helpful to most helpful treatment occurred for active questions. There is support for the hypothesis that subjects will derive greater benefit from questions if faced with a challenge to their competence, but the situation is complicated by the evidence for sex differences in response to this challenge.

9.2.5 Study II : Nature of Subject

In the previous study it appeared that active and provided questions facilitated the learning and retention of prose material when the material was sufficiently difficult. Difficulty is, of course, a relational concept. Both the nature of the material itself and the verbal ability of the pupils have to be considered. Material offering difficulty to low ability pupils might be considered easy by pupils with high verbal ability. It might be safer to think in terms of subjective difficulty rather than difficulty as such. The terms 'High' and 'Low' as used in reporting the experiment were, however, relative. No low ability pupils had taken part. It therefore seemed useful to consider whether questions would be helpful to pupils in the lowest ability streams.

At the extreme position a task may be difficult enough to discourage subjects. Instead of difficulty providing a challenge to activity, it may result in avoidance behaviour. This suggests that there might be a point of optimum subjective difficulty and, if this is the case, that there might be a point at which the facilitative effects of questions, particularly active questions, will be at their greatest. In view of findings regarding sex differences, it might be predicted that this point will be set differently for boys and girls.

Procedure. Pupils in the *lowest ability streams* of the same school in which the first experiment was run were exposed to the 'difficult' prose material. A total of forty two boys and girls, aged thirteen to fourteen years took part. Five boys and nine girls were from the third of five ability streams, nine boys and six girls were from the fourth stream, nine boys and three girls were from the fifth and lowest stream. Pupils were allocated to three treatment groups, *viz.* Active Questions, Reading Split and Reading Single, matched for stream and sex, but otherwise at random.

Results. Results may be summarized as follows:–

Girls:	Reading gave higher scores than Questions.
Boys:	Questions gave higher scores than Reading.

Overall (taken stream by stream): No difference between Questions and Reading.

Table 9.3 Mean Percentage Scores for Questions and Reading Treatments

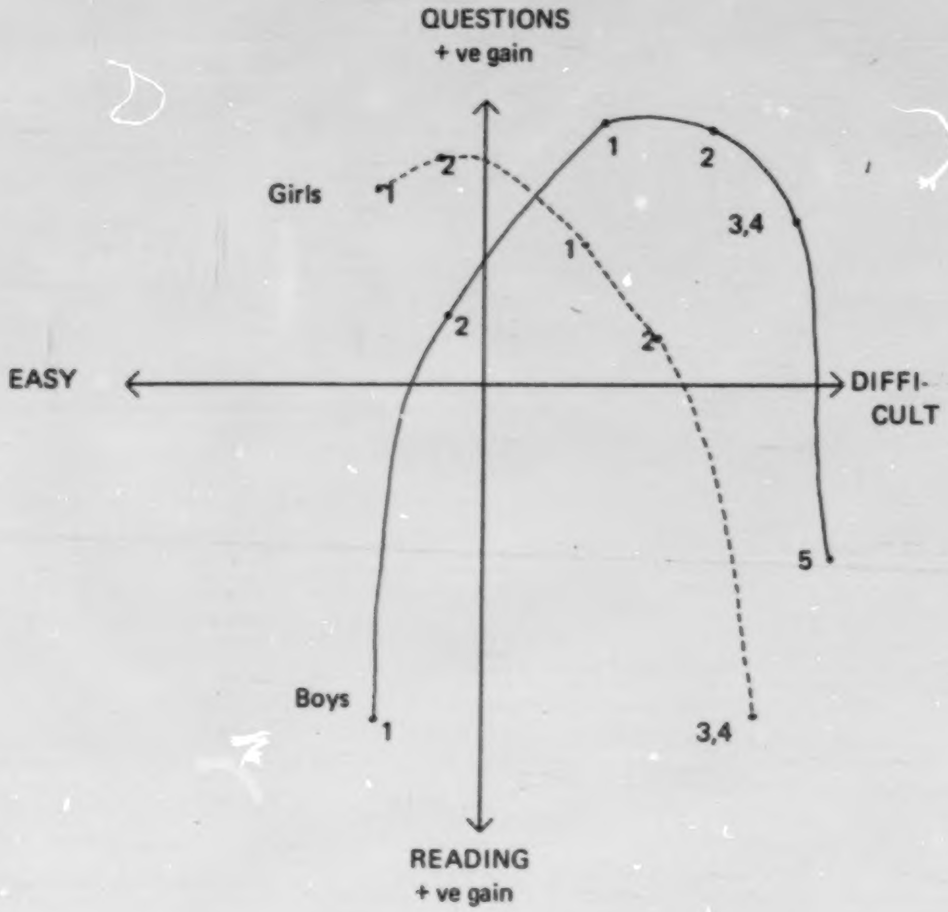
	Treatments			
Subjects	Reading		Questions	
	Single	Split		
Girls	18	17	13	Reading higher*
Boys	14	13	18	Questions higher*

*p <.05

Results are consistent with the suggestion that there is a point of subjective difficulty beyond which questions cease to be helpful. The treatments by sex interaction, shown in an analysis of variance to be statistically significant, is of particular interest in that it supports a suggestion that girls would reach the point of optimum challenge sooner than boys.

If these results are taken together with the results of the previous study which used subjects from the upper streams, the tendency to benefit from questions rather than reading can be represented by a 'challenge to competence' curve which is shaped the same for both boys and girls, but begins and finishes later for the boys. This can be shown schematically.

Fig. 9.2. A Schematic Representation of Gain from Questions and Reading, (summarising results of Studies I and II).


QUESTIONS
+ ve gain
Girls
1
2
1
2
3,4
1
2
EASY
DIFFI-
CULT
5
Boys
1
3,4
READING
+ ve gain

Key:

1 to 5 Ability levels (or streams). 1 is high

Positive (+ve) gain from questions implies negative (−ve) gain from reading and vice versa.

Results may be read off from the above figure as follows:-

Boys – Easy task, stream 1: reading +ve gain (i.e. questions −ve gain)
Difficult task, streams
1 to 4 : questions +ve gain,
stream 5 : reading +ve gain

Girls – Easy task, streams
1 and 2 : questions +ve gain
Difficult task,
streams 1
and 2 : questions +ve gain
streams 3
and 4 : reading +ve gain

9.2.6. Study III: Retention Interval

It is arguable that a post-test given within a matter of minutes after the completion of the study and learning period does not offer an adequate measure of retention. A test given weeks or months later might be held to give a better index of remembering; and from a teaching point of view, long-term results are of greater practical interest.

There are difficulties in this kind of argument, for it tends to assume that there is a valid dichotomy between short-term and long-term memory. A test given soon after the study period appears to be sampling short-term memory, but it may be more correct to regard this as a special case of secondary memory. A test given weeks or months later could be regarded as sampling secondary memory over the long-term interval. (*cf,* Waugh and Norman, 1965). The problem is to know whether anything different happens over the long- as opposed to the short-term interval. Early items in a series may be forgotten because of retroactive interference (Waugh and Norman), decay of the original trace formed by the items (Brown, 1964), or because they have not been organised into meaningful patterns for incorporation into the secondary memory store (Wood, 1969. *cf.* also Ausubel, 1963, 1968).

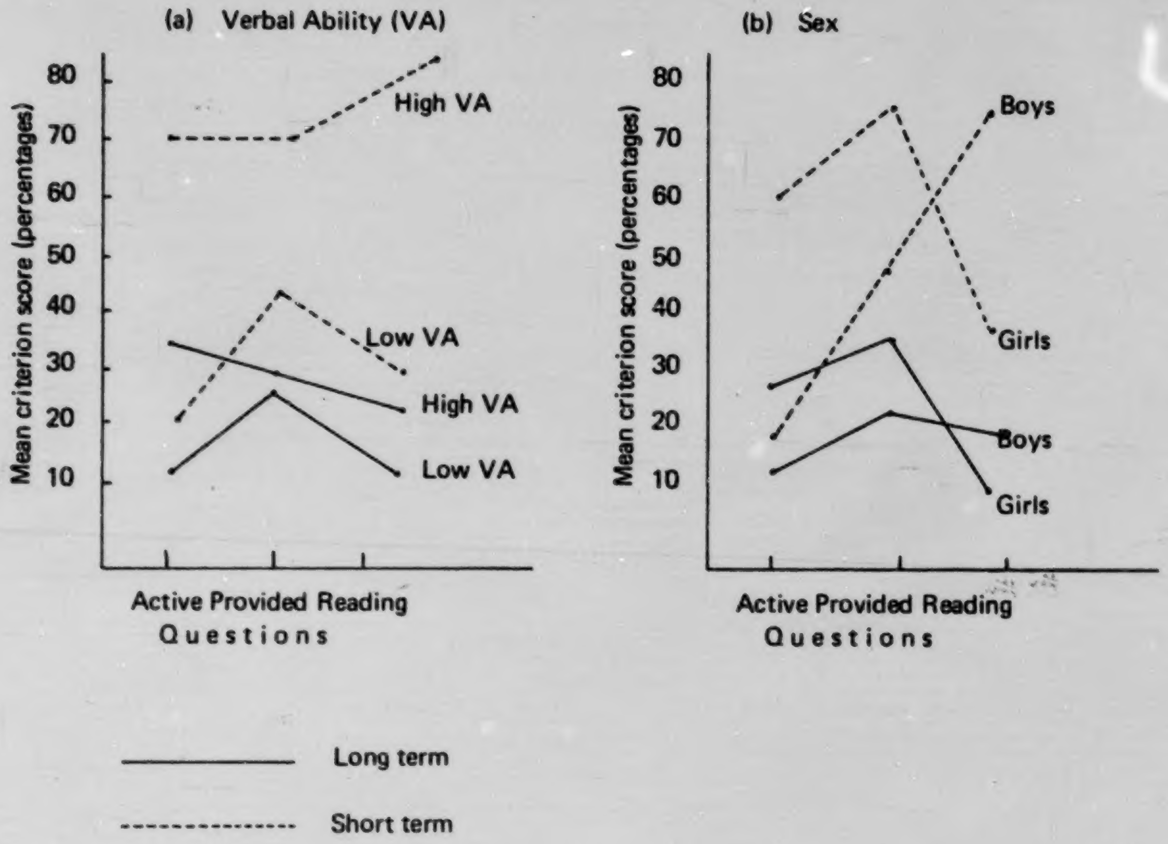
It is possible that by asking questions, pupils will be led to impose some pattern upon study materials, and that more permanent mental (or cognitive) structures will be established in consequence. In the short term, rote-learning strategies may be employed, so that differences between qeustions and reading treatments are obscured. If questions facilitate meaningful learning, then their special effects may be more likely to appear in the long term.

Procedure. After seven months had passed, the pupils who had taken part in the first experiment (Study I) were re-visited. Forty four of the forty seven pupils who had taken part in the experiment relating to 'easy' prose material were available: only twenty two of the thirty pupils who had taken part in the experiment relating to 'difficult' material were still available. The post-test which had been given previously was re-administered.

Results. Results show that with easy prose the benefit derived by the girls from questions, particularly provided questions, reached a higher level of significance statistically (one per cent), and the hindering effect of active questions was no longer evident in the case of the boys. As for the high ability subjects, instead of being significantly hindered by questions, they now gave evidence of slight benefit from them in the case of easy prose. With difficult prose, the overall benefit obtained from questions now reached an acceptable level of significance, (five per cent) although the superiority of active questions was no longer statistically significant.

Discussion. Although there was no great deviation from the pattern of results obtained in the short term, the slight improvement differentially in favour of questions may be held to support the suggestion that questions facilitate meaningful learning. It may be that subjects are more likely to think again about topics concerning which they have asked questions, so that active questions have the effect of increasing rehearsal probabilities. This could also apply to provided questions insofar as pupils were required to process material through their answers to the questions. It is not, however, clear from this study whether the effects of the tetention interval are the same for both active and provided questions.

Fig. 9.3. Short- and Long- term Retention Scores obtained under Active Questions, Provided Questions, and Reading Treatments by
(a) High and Low Verbal Ability (VA) Subjects and
(b) Boys and Girls



9.2.7. Study IV: Inspection Time

In addition to the active questions and provided questions groups, a combined active and provided questions group had been used in the first experiments. It was expected that this combined group would obtain learning and retention scores intermediate between those of the active questions and provided questions groups. Having the benefit of both treatments, they would not, however, have had as much time as the active questions subjects had in which to formulate questions. In the event, it was found that this combined group scored consistently lower than all other treatment groups.

It would seem that this group, instead of deriving benefit from both active and provided questions treatments, may have failed to derive any from either. In view of the fact that they were required to perform two tasks while the other groups performed one, the time taken for the change of mental set may have accounted for a loss in efficiency.

That is to say there may have been a less efficient use of the rather small amount of time available. They did not have time to settle to either task. On the other hand, it could be objected that results with this group cast some doubt upon the validity of results for the two main questions groups. In order to clarify this particular issue it was decided to run an experiment where pressure of time would not operate to put the combined active and provided questions group at a disadvantage.

Two reading control groups had been used in the previous studies. The reading, single group had studied the prose passage for the whole of the study period. The reading, split group had spent the first 20 minutes of the study period reading the non-specific summary passage. With 'difficult' prose, the reading, single group had obtained higher scores than the reading, split group. The reason for this result may be that the reading, single group had much longer access to the full passage than any of the other groups, and in the short term would be most likely to benefit if constrained to inspect material during a stipulated period. If, however, this group had been allowed to surrender the material when they felt that they had had enough time, the period of inspection may have been shorter for this less interesting task.

It was, therefore, decided to re-run the experiment with 'difficult' prose only, removing restrictions on inspection times, and omitting the reading, split group. A clearer separation between questioning treatments and reading controls was expected, and the position of the combined active and provided questions group was expected to improve.

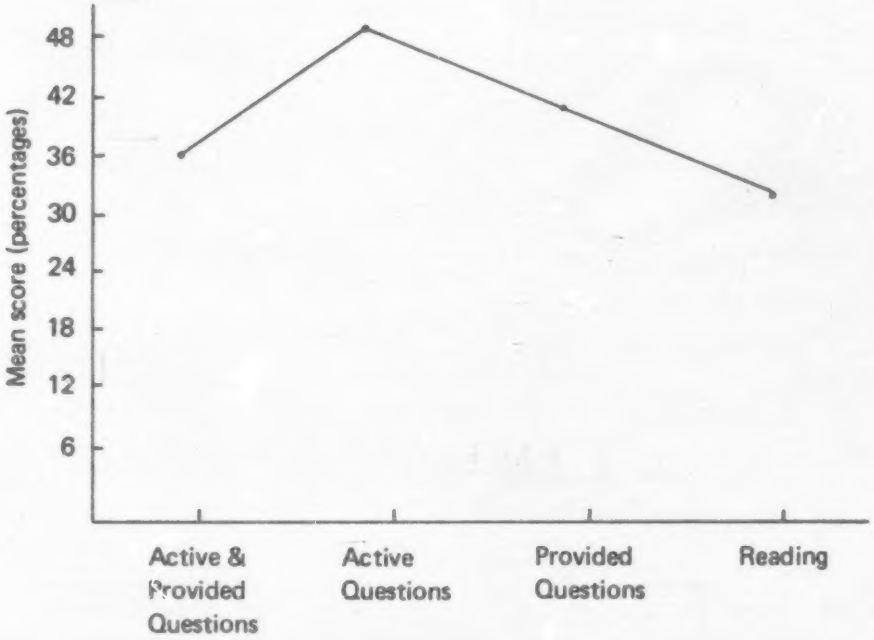
Procedure. Altogether, forty eight boys and girls, aged fourteen to fifteen years, took part. Twenty pupils were taken from the upper two of five streams in a neighbourhood comprehensive school other than that in which the previous experiment was run. A further twenty eight subjects were taken from the next two streams of the same school. The two ability groups were designated High and Low streams respectively. Pupils were assigned at random within the High and Low streams to four experimental groups, corresponding to the active questions, provided questions, active and provided questions, and Reading, Single groups of the previous experiment. The pupils were told that they were being given different tasks, and that they were not expected to finish the different stages in each task at the same time. As each task was distributed, the written instruction was also given, 'Put up your hand to show that you are ready for the next stage'. The post-test was administered as though it were one of the stages, and on completion of the post-test, subjects were given another task which had the appearance of being related to the experiment, but merely served to fill time and keep them under the impression that the experiment was still in progress.

Results. Subjects scored higher under questioning conditions, but for Low stream pupils none of the differences was significant. The Active Questions Group obtained the highest scores. The combined Active and Provided Questions Group no longer obtained significantly lower scores than other groups, and in fact obtained slightly higher scores than the Reading Group. High stream pupils scored significantly higher than Low stream pupils.

Discussion. Although results support the prediction of an improvement in the position of the combined Active and Provided Questions Group, the expected clearer separation between questioning treatments and reading controls did not take place. The Reading, Single Group scores were not differentially depressed by the untimed inspection condition, whereas the Provided Questions Group scores were. It is possible that when subjects were offered provided questions, they soon satisfied themselves that they knew what these questions were, and that they had completed their task. They then felt that there was no further need of inspection behaviour. The Active Questions Group may have required more time to formulate questions, so that the matter of spare time and re-reading did not arise. The Reading, Single Group had to judge for themselves how long they should work at the material. Active and Provided Questions may differ in their effects upon inspection time, although it would probably require a series of presentations of material to indicate the relationship. This suggests the usefulness of an investigation of reading and writing time as variables.

In summary, it may be said that this study repeats the findings of Study I indicating the superiority of questions over reading in the case of difficult prose and helps to clarify the position with regard to the combined Active and Provided Questions Group.

Fig. 9.4 Scores Obtained with 'Difficult' Prose under Untimed Inspection Conditions for Four Treatment Groups



9.2.8 Study V : Successive Presentations – Relevant Active Questions*

According to Rothkopf's mathemagenic hypothesis, the behaviour of subjects in a learning situation may be more or less directed towards the effective acquisition of knowledge, depending upon such factors as location and frequency of provided questions, and the number of presentations of similar or comparable prose material. This behaviour across successive presentations was investigated. In Study IV above, results with regard to the operation of time allowed on performances were inconclusive, and hence the relevance of writing and reading time might be usefully explored further.

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*A full report of this experiment is given in the Appendix as an illustration of the methods and techniques used in this series of studies.

One reason why active questions may be supposed to have a greater facilitative effect upon learning than provided questions relates to the way in which subjects are led to conceive of the task with which they are faced. In the first place they are likely to want to ask questions if they feel that this is a learning situation, and that the learning task is itself relevant. That is to say, they need to be aware of a problem before they are likely to give verbal expression to this awareness in the form of a question. If subjects feel that their questions have a significant part to play in the learning process, they will be more likely to ask questions.

One way in which subjects might be led to feel that the task is relevant would be to give them answers to their questions. Another method would be to provide the information that might be supposed to answer a range of possible questions. This can be done by offering a list of answers to hypothetical questions. In this case, feedback is provided in the form of information related to the questioning procedure adopted by the subjects. In retrospect, they learn which of their questions were considered appropriate and worth answering. Quite possibly, under such circumstances, subjects will ask questions in order to get information regarding both the material and their own skill in asking questions. This is comparable with the classroom situation where the teacher says, for example, 'That is a good question'.

Procedure. The subjects were forty eight pupils, aged thirteen to fourteen years, taken from the upper two of five streams corresponding to ability and attainment in a neighbourhood comprehensive school, and divided by sex and reading ability. Although the upper streams were used, subjects above and below the median were labelled 'High' and 'Low' reading ability respectively.

A passage of moderately difficult biographical prose was divided into six paragraphs of approximately 150 words in length. The pupils were assigned to experimental treatment groups as follows:—

(i) Relevant Active Questions	–	Subjects read a summary of the paragraph, wrote questions asking for further items of information, and compared their questions with a list of possible answers.
(ii) Active Questions	–	As for (i) except that the pupils were not given the list of possible answers.
(iii) Provided Questions	–	Instead of writing questions, pupils wrote answers to questions, and then compared their answers with the correct answers.

This procedure was repeated for the six paragraphs, and subjects were instructed to proceed at their own pace. The time spent by them in performing each task was recorded. The post-test was a Cloze completion test similar to that employed in the previous studies.

Results. Results may be summarized under the three rubrics (i) Post-test scores (ii) Inspection time (iii) Number of questions asked.

(i) *Post-test scores.* Contrary to prediction, the Active Questions Groups did not obtain higher scores than the Provided Questions Group. In fact, results were in the opposite direction; and the difference between scores only failed to reach an acceptable level of significance when the main treatment effects were tested using a significant Sex by Reading Ability interaction instead of the within-cell variance as the error term in the analysis of variance. In the case of 'low' ability boys, the difference between treatments scores was negligible.

(ii) *Inspection time.* There was clear evidence of decline in inspection time over successive presentations for all experimental groups except 'low' reading ability boys exposed to the relevant active questions treatment. Writing time chosen was greatest for provided questions subjects, again except in the case of 'low' ability boys.

(iii) *Number of questions asked.* In the case of 'low' reading ability pupils, particularly boys, more questions were asked by the Relevant Active Questions Group than the Active Questions Group. Otherwise differences were not significant. 'Low' reading ability boys asked more questions than 'high' ability boys, whereas 'high' ability girls asked more questions than 'low' ability girls. There was a statistically significant correlation overall between the number of questions asked, and learning scores obtained ($r = .55$, $N = 32$). For 'low' reading ability subjects this correlation was significant at the one per cent level ($r = .65$, $N = 16$), but for 'high' ability subjects it failed to reach an acceptable level of significance ($r = .45$, $N = 16$.).

Discussion of Results. With regard to post-test scores, it is possible that the task was simplified by repetition over a series of presentations, so that the situation corresponded more closely to the 'easy' prose condition of the first experiment. This could explain why the active questions treatments failed to give higher scores than the provided questions treatment. If this explanation is correct, results on that part of the post-test corresponding to the first presentation might be expected to approximate those found with 'difficult' prose in the first experiment. The only comparable treatments are active and provided questions, and in both experiments the Active Questions Group obtained higher scores. In this study, the superiority of the Active Questions Group reached an acceptable level of significance. The Relevant Active Questions Group were possibly at a disadvantage on the first presentation, in that their task was slightly more complicated; but results show that they made the biggest improvement between the first and second presentations. It was with the second presentation that the benefits of feedback might be expected for the first time; and this is what appears to have happened. However, in spite of the initial advantage that active questions had with the first presentations, provided questions were clearly at no disadvantage overall.

The sex by reading ability interaction indicated in the analysis of variance is of particular interest, for whereas girls gave evidence of a fairly consistent performance, the 'high' ability subjects obtaining higher scores than the 'low' ability subjects, boys' scores fluctuated as they reflected the different experimental treatment conditions in relation to their own ability. This is consistent with the suggestion made previously in connection with results of the first experiment that boys were possibly more task-oriented, whereas girls were more situation-oriented.

The prediction of a decline in time spent on both study and inspection over successive presentations was clearly supported by the results. A highly significant linear trend was found. Postponement of this decline in inspection time did not, however, occur overall for the Relevant Active Questions Group. Analyses of linear trend were performed, and although comparisons could not be made without the warrant of interaction effects, it was interesting to note that the variance of linear trend for 'low' ability boys under the Relevant Active Questions treatment offered the least deviation from zero. This is consistent with the point made in discussion of the scores; for it had been found that for 'low' ability boys the difference in scores between the treatments was negligible.

Table 9.4 Correlations between Inspection Times and Serial Position of Material

Group	Treatments Relevant Active Questions	 Active Questions	 Provided Questions
High Ability boys	–.64	–.47	–.51
High Ability girls	–.67	–.39	–.40
Low Ability boys	–.21	–.38	–.63
Low Ability girls	–.36	–.30	–.36

For each group, N = 24. There were 6 observations on both variables for each subject.

Fig. 9.5 Inspection Study Times over Successive Presentations for 'High' and 'Low' Ability Boys

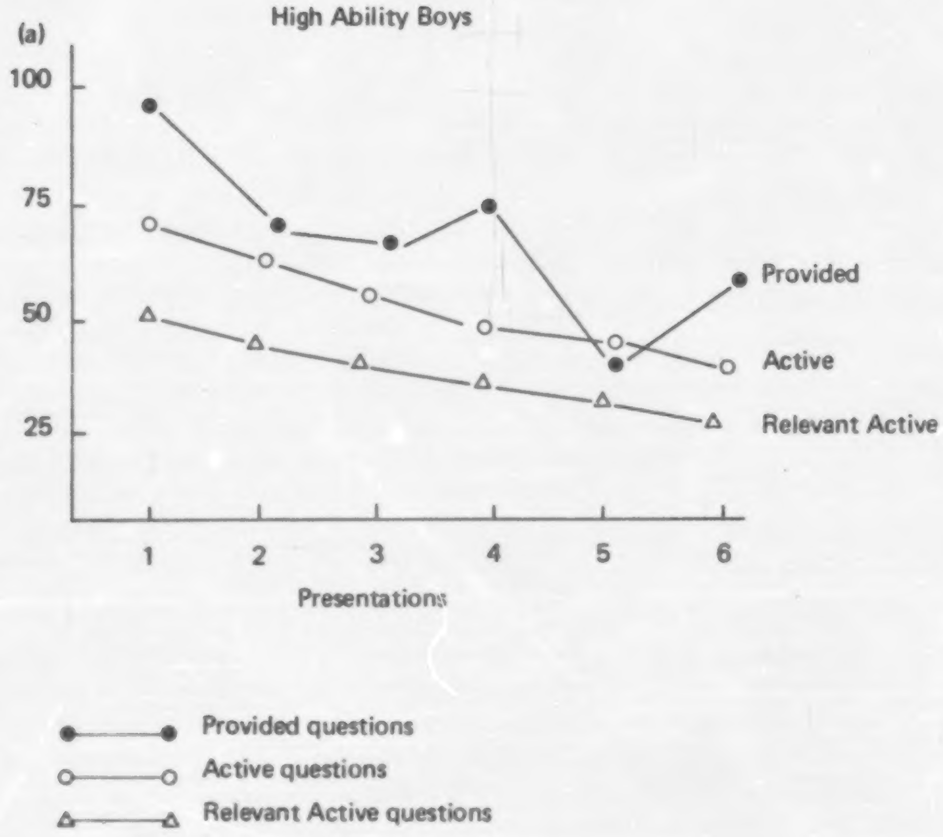
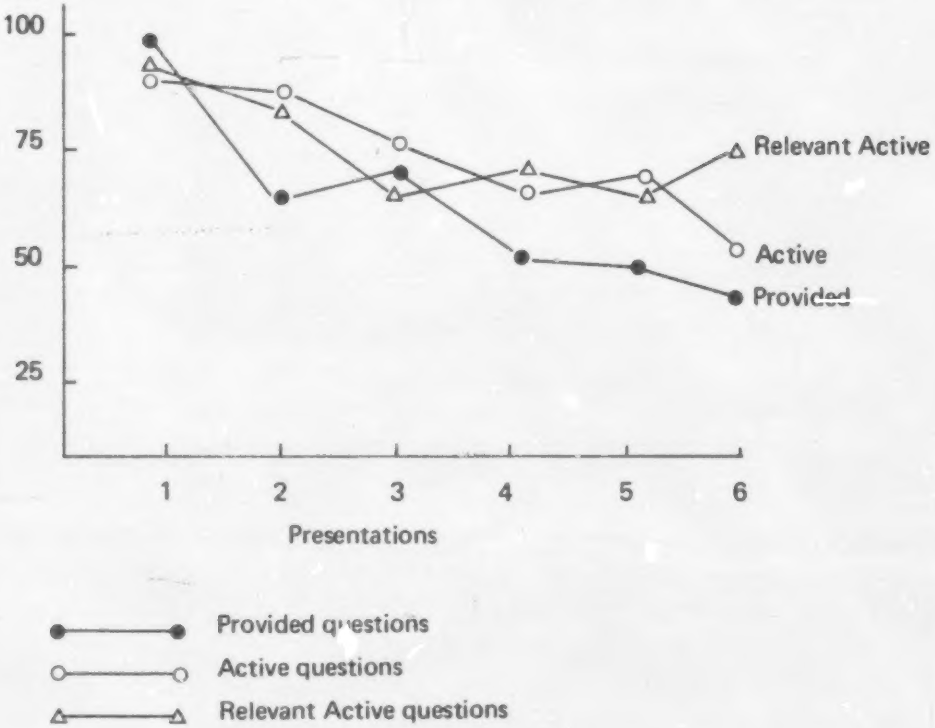


Fig. 9.5 – continued


(b) Low Ability Boys

Time spent on the writing tasks was greater for the subjects with provided questions than for the other experimental groups. This would help to explain why they tended to obtain higher scores. Here is one form of mathemagenic behaviour that is more closely under the control of the experimenter. These pupils were required to answer the same number of questions at each presentation, so that their writing task remained relatively constant. The Active Questions Groups could decide for themselves from presentation to presentation how many questions they would write, and consequently how much time they would spend at the task. This decision would be determined by their own conception of the task, and of the challenge that it presented. 'Low' ability boys again proved to be the special group. Whereas the amount of writing time for the Provided Questions Group was greater in the case of all other pupils, particularly 'high' ability boys ($p < .001$), the difference was not significant in the case of 'low' ability boys. This result is consistent with the findings for 'low' ability boys on scores obtained and time spent on study and inspection.

The Relevant Active Questions Group were expected to ask more questions than the Active Questions Group, because they had the opportunity of discovering that their questions had some part to play in the learning process. The only subjects for whom results in the expected direction approached an acceptable level of significance were the 'low' ability boys ($p < .05$ one tailed test). 'Low' ability boys tended to ask more questions in any case, whereas the 'high' ability girls asked more questions than the 'low' ability girls.

This gives further support to the suggestion that girls tend to be situation-oriented. 'High' ability pupils would be expected to manifest their ability by formulating more questions, and girls perform accordingly. Boys, however, tend to formulate questions if they feel that the task warrants it. 'High' ability boys were not sufficiently challenged, and consequently asked fewer questions than the 'low' ability boys.

9.2.9. Study VI: Successive Presentations – Retention Interval

The effects of retention interval upon scores obtained by the different treatment groups had been considered in Study III and, as expected, loss attributable to factors operating over a long-term interval was less pronounced for the Active Questions Group. The experimental design had not, however, permitted detailed investigation for this type of treatment by retention interval interaction. In order to obtain a less equivocal result, it was decided to follow up on the subjects who took part in the experiment investigating the effects of successive presentations (Study V).

Procedure. After ten months, thirty six of the original forty eight pupils were still available, and were re-tested. A further twelve pupils who had not taken part in the original experiment were also tested. They were able to act as controls, and their scores on the post-test were compared by t-test with the learning and retention scores obtained by the thirty six experimental subjects. Since the controls had not completed the immediate post-test, they were excluded from the main analysis of variance. Scores of the experimental groups were transformed to give a normal distribution, and subjected to a four-way analysis of variance. *Between*-subjects factors were

(i) Treatments: Relevant Active Questions, Active Questions, Provided Questions.
(ii) Reading ability: High, Low.
(iii) Sex.

The *within*-subjects factor offered two measures, *viz.* Long- and short-term Retention Interval. This gave a 3 x 2 x 2 x 2 repeated measures design, three replicates to each cell.

Results. As predicted, a treatments by retention interval interaction occurred ($p < .001$). Loss attributable to factors operating over the ten months' interval was greatest for the Provided Questions Group, and least for the Relevant Active Questions Groups. In fact, the difference between short- and long-term scores for the Relevant Active Questions subjects was negligible. Almost exactly the same scores were obtained by the three treatment groups on the long-term retention post-test. This means that even if short-term results are interpreted as having shown that provided questions are more effective than active questions, from a long-term point of view active questions and relevant active questions appear to have been at least as effective in facilitating the learning and retention of prose material as provided questions.

Although differences between long-term retention scores obtained under the three treatment conditions were negligible, the comparison of means indicated a large difference ($p < .001$) between scores obtained by experimental subjects and controls. It is possible that the scores of controls were inflated as a consequence of some contact with experimental subjects: but even if it is assumed that this did not happen, and that the performance of controls was not above chance level, the experimental scores were still clearly superior and may reasonably be attributed to learning under the experimental conditions.

Fig. 9.6. Relations between Material Remembered for Short- and Long-term Retention Intervals as a function of Question Treatments

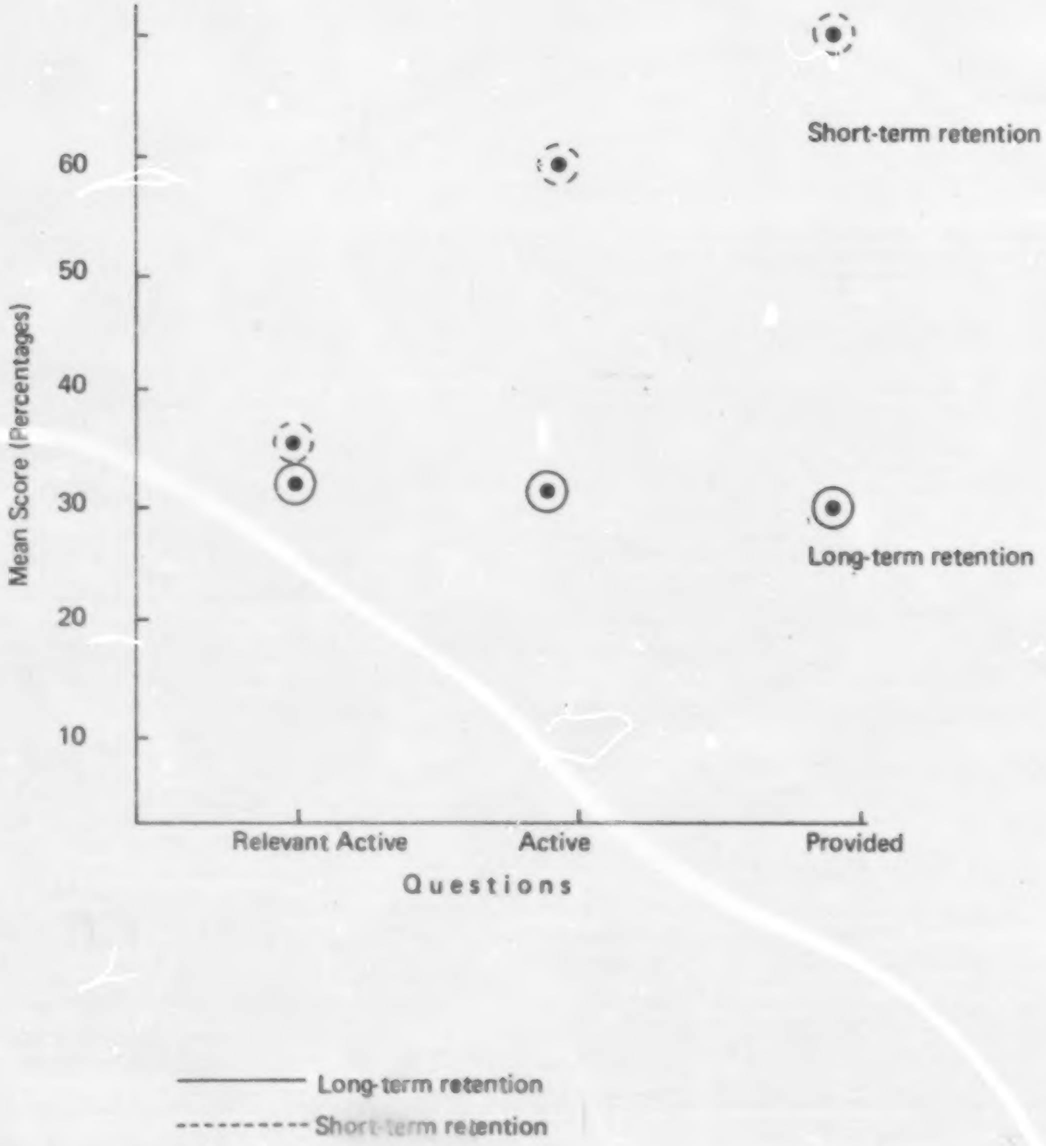


Table 9.5. Long-term Retention Scores (percentages) Obtained by Experimental Treatment and Control Groups for Boys and Girls

	Questions Treatments			Controls
	Relevant Active	Active	Provided	
Boys	40.0	33.3	36.7	19.3
Girls	30.0	34.7	30.7	16.7

Discussion. The results of this study are of special interest from a pedagogical point of view, and could help teachers overcome any reluctance to substitute the pupils' own questions (*i.e.* active questions) for what are presumed to be the more expertly framed provided questions. Of course, active questions have not been shown to be superior, but similar scores may have been obtained by the three experimental groups for different reasons.

Assuming that these reasons are of practical importance, some light may be shed upon the situation by considering the reading age by sex by retention interval interaction, which was just significant at the five per cent level. Such higher order interactions are not always easy to interpret, but a brief description of the pattern of results may be helpful. In order of magnitude, loss attributable to retention interval was as follows:-

1. High ability boys
2. High ability girls
3. Low ability boys
4. Low ability girls

This is consistent with the results of Studies I and II which suggested that questions particularly active questions, were most helpful when subjects were faced with a challenge to their competence, and that girls were more ready to take an experimental task seriously as a task.

Applying these principles to the experimental groups used in Studies V and VI, an expected rank order of magnitude of loss attributable to Retention interval, within each factor, would be as follows:-

Treatments: 1 – Provided 2 – Active 3 – Relevant Active
Ability Level: 1 – High 2 – Low
Sex: 1 – Boys 2 – Girls

This could, of course, generate a number of sequences overall, depending upon the extent to which the effects of any given factor are given priority.

e.g.

1. The main division Treatments, with either (a) Ability of (b) Sex as chief sub-division.
2. Dividing on Ability level, with either (a) Treatments or (b) Sex as chief sub-division.
3. Dividing on Sex, with either (a) Treatments or (b) Ability as chief sub-division.

When for each of these six possible sequences, the observed rank order was plotted against the expected rank order, correlation coefficients (Spearman's rho) were computed as follows:-

1	(a)	.81**	(b)	.71**
2	(a)	.84***	(b)	.65**
3	(a)	.31 NS	(b)	.33 NS

* $p < .05$; ** $p < .01$; *** $p < .001$; NS Not significant; N (Number of paired observations) twelve in all cases.

9.2.10. Study VII: Advance Preparation and Wider Context

If, as suggested in the previous study, a consistent picture is emerging of the way in which active questions work, it will be useful to look more closely at those features which appear to distinguish between active and provided questions.

Provided questions may serve the purpose of drawing the attention of pupils to those points which the teacher wishes them to remember. They are a means of leading pupils to rehearse these points, and tend to encourage a rote-learning approach to the task.

In the case of more able pupils, it may be supposed that they have a better store of thought patterns or cognitive structures with which new items of information can be systematically integrated without much difficulty. Such pupils may find the task uninteresting, but they will learn and remember some of the material in spite of this. For them there will be two kinds of learning, *viz.* (1) Rote learning, which is facilitated by the rehearsal of items to which attention has been drawn by the provided questions, and (2) Meaningful learning, which is facilitated by the availability of an existing body of relatively well organised knowledge (cognitive structure) and brought about by the simple juxtaposition of provided questions and the material to which they relate.

In the short-term, results of both kinds of learning will be apparent; but in the long term, information learned by rote will tend to be lost because by definition it will not have been meaningfully related to existing knowledge. Using the analogy of a filing system, information which has not been carefully categorised is not readily recovered.

In the case of less able pupils, although their store of cognitive structures will not be as great, the need to formulate their own (active) questions encourages a more deliberate relating of new information to their existing knowledge. In their case, with the challenge of a comparatively difficult and possibly more interesting task, there will tend to be greater emphasis upon meaningful as against rote learning. To this extent, therefore, low ability subjects will have less to lose in the long term. In other words, such gains as they do make in the short term will be relatively permanent.

If this is a fair assessment of the position, two further possibilities may be usefully explored:-

(1) Perhaps the difference between high and low ability subjects can be diminished by providing all subjects in advance with a pattern or structure to which new information is easily related. By exercising some control over the cognitive structure variable in this way it might be possible to expose the tendency for provided questions to encourage rote learning, while active questions strengthen the meaningful learning approach. Evidences for rote learning could be adduced from the presence of primary and recency effects which appear in, and tend to be characteristic of, rote-learning experiments.

(2) Perhaps subjects will be encouraged to use a meaningful learning approach to material when offered a wider context to that material. As well as being offered text material which they are expected to learn, pupils can be given the opportunity to gain supplementary information from context material. This extra information may come in

the form of answers to hypothetical questions (*i.e.* provided questions), or be available in answer to real questions (*i.e.* active questions). If subjects are led to see a relationship between their own questions and the extra material, they may be more ready to look for meaningful relationships throughout the learning situation.

Procedure. A series of experiments was undertaken, in which the effects of these variables were investigated using a number of designs, but the same basic materials. A passage of 600 words was selected from 'The Pyramids of Egypt' by I.E.S. Edwards, London: Penguin books, 1947. A list of sixty four items of information based on this passage was compiled. This was then divided into four sections, each containing sixteen items of information. These four sections were labelled 'context' passages.

> *e.g.* 'In early hieroglyphic writings the *ba* was represented by a stork with a tuft of feathers on the front of its neck; later the sign was changed to a bearded human-headed bird preceded by a lamp'.

Items of information were then cut from these sections as evenly throughout the sections as possible until there were eight items in each section. These shorter sections were labelled 'text' passages, and served as the required text, or text to be learned.

> *e.g.* 'The *ba* was represented by a stork, and later by a human-headed bird'.

These were then systematically reduced to form sections comprising four items, two items, and finally one item of information. These sections were used to provide the advance preparation, which was built up again on the items of information beginning with the shortest sections of one item per section. The items of information did not correspond to the 'bits' of information theory, but were taken as convenient units to be learned by subjects.

> *e.g.* 'The *bas* were sometimes shown as birds'.

If these items are regarded as statements, the first task in the advance preparation was for subjects to read the four statements. They then completed sentences corresponding to the statements, but from which two words had been deleted. A list of four clues followed, and subjects were required to write the words suggested by the clues.

> *e.g.* Clue: 'Sometimes they used to shwo them as birds'.

This was followed by eight statements, with eight sentences to complete and eight clues to solve. Finally sixteen statements followed, with sixteen sentences to complete and sixteen clues to solve.

Experiment 1. In the first experiment of this series, forty boys and girls, aged thirteen to fifteen years, taken from the third and fourth of five streams corresponding to ability and attainment in a neighbourhood comprehensive school, took part. All pupils were given the advance preparation task during the first visit. They were then re-visited and assigned to four experimental groups:

(i) Active questions, with context.
(ii) Active questions, without context.
(iii) Provided questions, with context.
(iv) Provided questions, without context.

Three-way analysis of variance was operated on post-test scores subjected to square root transformations. Between subjects factors were (a) Questioning treatments and (b) Availability of Context. A within subjects factor, *viz.* Presentations, offered four measures; the text material to be learned was presented to subjects in four sections.

A test for primacy and recency effects was made by subtracting the total for the second and third presentations from that for the first and final presentations for each subject. The means of these difference scores for the Active and Provided Questions Groups were then compared by t-test.

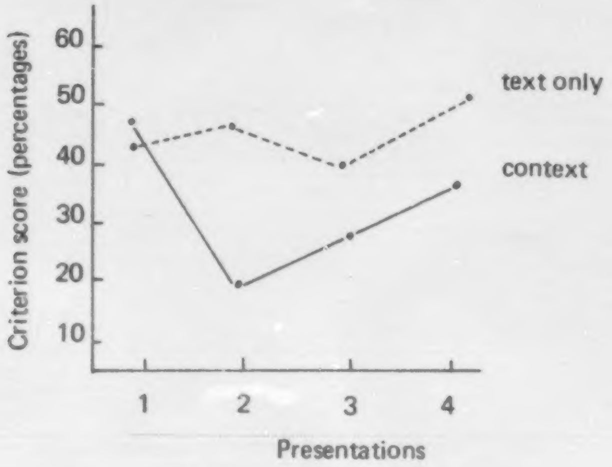
Effects of the between-subjects factors were not statistically significant. Hence, neither the provision of contextual information nor the type of questions used affected the amount of material learned. The effects of presentations were, however, significant at the .01 per cent level, and clearly offered a primacy and recency pattern. The treatments by presentations interaction did not, however, reach an acceptable level of significance, so that although comparison of difference scores by t-test gave a primacy and recency effect for provided questions that was more pronounced than for active questions ($p < .05$), clear support for a difference between treatments in mode of operation cannot be adduced from this experiment.

Experiment 2. In the second experiment of this series, a Control Group was added whose task did not include the asking or answering of questions. Pupils were required to find words to solve clues. Half of the pupils were given the advance preparation so that the effects of this factor could be investigated. Primacy and recency effects were expected to be less pronounced in their case, as the preparation should act in a manner analagous to that of Ausubel's (1963) 'advance organizer', and facilitate meaningful learning. Except for the addition of a Control Group and the restriction of advance preparation to half of the pupils, procedure was the same as for the first experiment in this series. Twenty four pupils, boys and girls from the first of five streams took part, and were from the same school as the subjects who took part in the first experiment.

Four-way analysis of variance was operated on the post-test scores. The raw scores were found to be normally distributed. Between subjects factors were (a) Advance Preparation: Prepared or not prepared, (b) Questioning treatments: Active questions, Provided Questions, Controls, (c) Availability of Context: Text only, or with context. The within subjects factor, *viz.* Presentations, again offered four measures.

Effects of the between-subjects factor were not statistically significant. Hence the amount of material learned was not affected by the provision of advance preparation or contextual information, nor by the use of questions. Once again, however, the effects of presentations were significant ($p < .001$). Primacy and recency effects occurred for all groups, but scores obtained on the third presentation were lower than those on the second presentation (a) when context was not available (b) when there was no advance preparation and (c) for the Provided Questions Group. The context availability by presentations interaction was significant ($p < .05$). This result is difficult to interpret in view of the fact that context material was given to subjects after each presentation of text material. It is possible, however, that the provision of context material had a cumulative interference effect reaching back from the fourth to the second presentation, and offset at the fourth and final presentation by the familiar recency effect. This would be a special case of retroactive interference.

Fig. 9.7 Effects of Presentations and Context upon Learning Scores



Experiment 3. The pupils were re-visited and re-tested after one week, and it was found that the gains of the group given advance preparation were more permanent. The advance preparation by retention interval interaction did not, however, quite reach an acceptable level of significance.

Experiment 4. In order to ensure that effects reported in the first two experiments of this series were not artefacts and not attributable to variations in the difficulty level of the passages to be learned, it was decided to run an experiment exposing subjects to only two of the four presentations. No difference was expected between scores obtained on these. Twenty four boys and girls took part, aged fourteen to fifteen years, and from the third of five streams. Half of the subjects were given advance preparation. There were three treatment groups:

(i) Active Questions
(ii) Provided Questions
(iii) Controls

Half of the subjects in each treatment group were given the context passage.

Pupils were given two of the four text passages, and where context passages were given the two corresponding context passages. Half of the subjects were given the first two text passages, the remainder were given the last two text passages. These were distributed alternately, so that the division was made evenly throughout the experimental treatment groups.

Almost exactly the same scores were obtained on the first and second presentations. Zero variance was found for the effects of presentations. Comparison of means by t-test shows that subjects given the advance preparation obtained higher scores than those who were not ($p < .05$).

The effects of treatments were not significant, and the difference between the two Questions Groups taken together and Controls, was negligible. It was, however, interesting to find that with these lower ability subjects the Active Questions Group obtained higher scores than the Provided Questions Group ($p <.05$).

Experiment 5. Results of experiments in this series suggest that context passages interfere with learning. An experiment was therefore designed to investigate the possibility of maximizing this interference effect. By halving the amount of time available to subjects, it was thought possible to increase the tendency for subjects to use rote-learning strategies. Twelve girls took part, aged fourteen to fifteen years, and taken from the two upper of five ability and attainment streams of a neightbourhood comprehensive school other than that in which the previous experiments were run. All subjects were given the advance preparation, and there was no Provided Question Group. Half were given the context, and half were not.

Results for the effects of context availability were according to prediction. The pressure of time seems to have sharpened the interference effect, so that the difference favouring the group not given the context reached an acceptable level of significance ($p <.05$).

Experiment 6. If, as results in the previous experiment suggest, pressure of time has the effect of increasing interference from context availability, it should be possible to reverse the process. In the final experiment of this series, it was decided to use older and more able subjects, and to dispense with advance preparation. Instead of deriving a meaningful structure from this preparation, subjects would find it in the context passages.

In order to determine whether or not subjects derived a measure of feedback from the context, it was decided to offer the context either before or after the text passages. If subjects under the active questions treatment were deriving this feedback from the context, they should obtain higher scores when the context is given after the text passage, and after having written questions.

Twenty four boys and girls aged fifteen to sixteen took part. They belonged to the first of four ability and attainment streams in the neighbourhood comprehensive school where the earlier experiments in this series were run. Subjects were assigned to four groups. The first two groups were presented with the context passage after the text passages. The second two groups were presented with the context passages before the text passages. One of the 'Context After' and one of the 'Context Before' groups received the active questions treatment in connection with the first two presentations, and the Control Task for the third and fourth presentations. The other group in each case received the Control Task first.

Three-way analysis of variance was operated on scores previously subjected to square root transformations. Between-subjects factors were:–

(a) Position of Context passages – Before or After.

(b) Treatment sequence – Active questions followed by Control Task or following Control Task.

The within-subjects factor was treatments, Active Questions or Control Task.

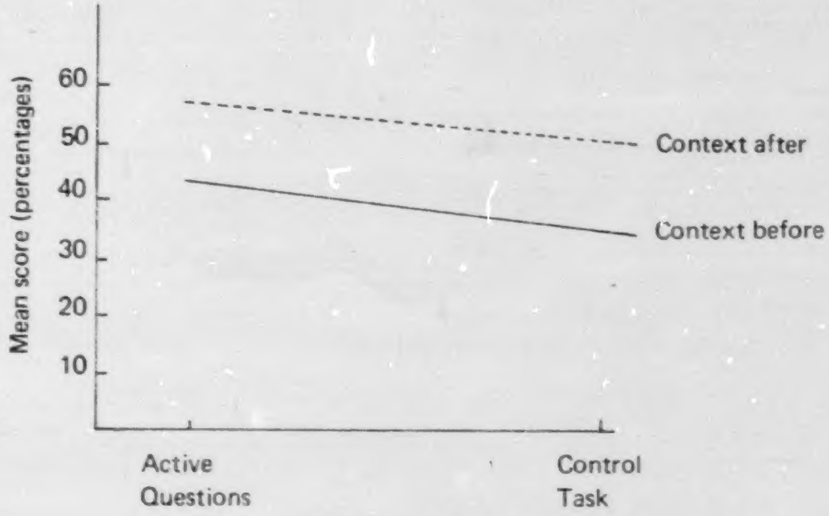
The effects of position of Context passages were significant ($p <.025$). Subjects given the Context passages *after* the text passages obtained higher scores.

The within subjects effects of treatments were also significant ($p <.025$). Higher scores were obtained under the Active Questions treatment.

Results for the effects of position of context were as predicted, but in the absence of a treatments by position of context interaction, no indication is given of the way in which the Active Questions Group derived special benefit from the availability of context. Furthermore, in this experiment the context passage was always available. The results could therefore be interpreted as indicating that the pre-text position of the context offered interference, while the post-text position offered *less* interference. However, as subjects were older, and taken from the highest ability stream, it is not likely that the pre-text availability of context would have offered them any difficulty. The post-text availability of context would, therefore, appear to have helped rather than hindered learning.

In the previous experiments, between-subjects error variance had tended to depress the effects of the different experimental questions treatments. There was less doubt about the effects of the within-subjects factors such as presentations and retention interval. In this experiment, the two experimental treatments formed a within-subjects factor. That is to say, subjects served as their own controls. A more satisfactory separation between the effects of active questions and a control task appears to have resulted from this.

Fig. 9.8 Scores Obtained by above Average Ability Subjects acting as their own Controls, under Active Questions and Control Task Treatment Conditions, with Context Provided either Before or After Text



Summary. The results of experiments in this series show that:

(i) When subjects were given advance preparation, primacy and recency effects occurred for all treatment groups, but appeared to be more pronounced for the Provided Questions Group.

(ii) When subjects were given wider context, a retroactive interference effect appeared to occur, and this effect was exacerbated when the amount of time available to subjects was restricted.

(iii) Loss attributable to long-term retention was less for subjects given advance preparation.

(iv) When subjects were exposed to two presentations of material, there was no difference between scores obtained on tests relating to each of the presentations.

(v) With subjects of relatively low ability, advance preparation predictably assisted learning and, although questions treatments gave no advantage over controls, active questions were of greater benefit than provided questions.

(vi) Above average ability subjects, acting as their own controls, derived greater benefit from active questions than from the control treatment, when there were only two presentations.

(vii) For these higher ability subjects, context given after text material was more helpful than context given before.

Discussion. The two chief problems investigated in this series were:

(1) Do questions make a contribution towards meaningful learning that may not otherwise be made if subjects are given a carefully structured advance preparation?

(2) Does question-asking encourage subjects to look for and derive a more meaningful understanding of prose material from a wider context?

With regard to the first of these problems, advance preparation appears to have made some contribution to learning, particularly in the case of below average ability subjects. Evidence for a contribution towards meaningful learning by the use of questions, over and above that made by advance preparation, is less clear. Primacy and recency effects occurred for both questions groups when all subjects were given advance preparation, so that rote-learning strategies appear to have been used to some extent at least. On the other hand, the finding that primacy and recency effects were less pronounced for the Active Questions Group than for the Provided Questions Group lends support to the suggestion that subjects asking their own questions are more likely to look for meaningful relationships in the material.

With regard to the second problem, in the first five experiments of this series there is no evidence to suggest that the availability of wider context encourages meaningful learning, either with or without the use of questions. In the experimental situation at least, subjects preferred to concentrate upon learning the text material. Wider context interfered with this task, particularly when subjects were under pressure of time. In the final experiment of the series, older subjects of above average ability were used; and in this one experiment where context availability appears to have helped, and where context given *after* text material was more helpful than context given *before* text material, the effects of position of context were the same whether subjects asked questions or performed a control task. It is, however, arguable that the higher scores obtained by subjects when they asked questions indicate that they made more efficient use of the context material, irrespective of its position in relation to the text material.

9.2.11 Study VIII : Questions and Other Syntactic Transformations

Transformational grammarians, taking their lead from Chomsky (1957), have produced an analysis of language which separates out different rules for generating sentences. Underlying each sentence, a kernel string is presupposed, and this is sometimes referred to as its deep structure. This kernel string can be arranged in a number of ways in order to generate particular sentences. The order of words, and the form (particularly the endings) of words can be varied according to certain basic rules. These different ways of processing the hypothetical kernel string are referred to as transformations, and the sentences that are generated by this process are considered to give the surface structure of the sentences of a language.

Psychologists are interested in the implications of this point of view for an understanding of the memory processes involved in learning verbal material. When, for example, pupils receive information in the form of a question, it may be that in order to store this information in memory, they transform the question into a kernel string, *i.e.* into a form which approximates to the active voice of traditional grammar, *e.g.* they may be asked the question,

'Did Cromwell help Henry to destroy the monasteries?'

and be given the answer,

'Yes'.

In this case, the pupils will possibly retain the information, or at least reproduce it, in the form,

'Cromwell helped Henry to destroy the monasteries'.

In the same way, it is possible that information offered in the passive voice will be transformed into the active voice. *e.g.* The statement,

'Henry was helped by Cromwell to destroy the monasteries',

can also be stored in memroy in the form,

'Cromwell helped Henry to destroy the monasteries'.

This is, in fact, a transformation. The kernel string would be in an even simpler form, *viz.* Cromwell – help – Henry

'help' becomes 'helped' by the addition of 'ed'. 'Henry' is elaborated by the addition of 'destroy – monastery'. 'Destroy' becomes 'to destroy', and 'monastery' becomes 'monasteries' by substitution of the appropriate plural ending 'ies' for 'y'.

Our chief concern here is for the more fundamental transformations from passive to active voice, and from interrogative to indicative mood. At what stage this kind of transformation is performed, and the extent to which it is necessary, may be a matter of debate. (For a fuller discussion, see Mehler, 1963; Savin and Perchonock, 1965; Johnson-Laird, 1968; Wright, 1969). Assuming, however, that such transformations are made, it is arguable that questions help learning simply because pupils are required to *engage in the additional activity of processing material in this way.*

If this is the case, then provided questions should offer no greater advantage to pupils learning verbal material than the other transformations. Active questions should be in much the same position, and, to the extent that they are less expertly structured than provided questions, may be less helpful. Any advantage that active questions might possess over other transformations could be expected to occur in the situation where (a) the question is relevant for the pupil: that is to say, some challenge is presented to his competence, and where (b) there is opportunity for the special advantage of meaningful as against rote learning to show itself, *e.g.* in the long term.

Procedure. A series of experiments was run with 114 pupils, boys and girls, in six different school classes in the third and fourth forms, ages thirteen to fifteen, of the same school.

Two lists of ten sentences were drawn up, and took the form of affirmative sentences in which one modifier, equivalent to the adverb or indirect object of traditional grammar, usually occurred in the verb phrase, *e.g.* 'The farmer paid the workers a much bigger wage in winter'. Non-specific sentences were formed by removing two words from each of the full sentences and replacing them by non-specific terms, usually pronouns. These terms were underlined, *e.g.* 'He paid the workers a much bigger wage then'.

All pupils were givwn the non-specific sentences, and then learned the full sentences under the following experimental conditions:

I. A selection from six treatments
  - (i) Active Questions – Subjects were required to write one question about each of the non-specific sentences, asking for more information. They then received the full sentences.
  - (ii) Provided Questions – After receiving the full sentences, subjects answered questions about them. *e.g.* 'When did the farmer pay the workers a much bigger wage?'
  - (iii) Transformed sentences, Passive – After receiving the full sentences, subjects completed corresponding sentences in the passive voice. *e.g.* 'The workers were paid a much bigger wage in ....?'
  - (iv) Transformed sentences, Interrogative – After receiving the full sentences, subjects completed corresponding sentences in the interrogative mood. *e.g.* 'Did the farmer pay workers a much bigger wage in ....?'
  - (v) Transformed sentences, Imperative – After receiving the full sentences, subjects completed corresponding sentences in the imperative mood. *e.g.* 'Farmer, pay the workers a much bigger wage in ....'
  - (vi) Untransformed sentences – After receiving the full sentences, subjects completed corresponding untransformed sentences. *e.g.* 'The farmer paid the workers a much bigger wage in ....'

II. Four different post-tests, two relating to each list of sentences, offering sentence completion tasks in which the sentences were either
  (i) Transformed *e.g.* 'A much bigger wage was .... by the .... in .....'
or (ii) Untransformed *e.g.* 'The .... workers a much bigger wage in ....'

III. Two basically different intervals between learning the material and doing the post-test
  - (i) Short term, in which the interval was filled by a brief task lasting fifteen minutes.
  - (ii) Long term, ranging from one to five days.

IV. In some cases the whole procedure occupied one double lesson period of one and a quarter hours. In other cases, two such double lesson periods were used.

It was possible to make a number of specific predictions, bearing in mind the results of the previous studies.

(i) *Provided Questions*

No difference was expected between scores obtained by the Provided Questions Group and the Transformations Group.

Explanation: Transformations, as well as questions, facilitate learning by requiring subjects to process the material.

(ii) *Active Questions*

In the *short term*, the Active Questions Group were expected to obtain lower scores than Transformations Groups.

Explanation: Active questions are probably less expertly framed than the Transformed sentences supplied by an experimenter, and no challenge to competence is offered by simple propositional sentences.

(iii) In the *short term,* the difference between scores obtained by the Active Questions Group and Transformations Groups was expected to be less pronounced on the untransformed post-test.

Explanation: A close match between the sentences learned and the post-test sentences could be expected to facilitate rote learning. For the Transformations Groups, particularly subjects given the passive sentences for completion, there was this closer match.

(iv) In the *long term,* the Active Questions Group were expected to obtain higher scores than the other groups.

Explanation: The special effects of Active Questions relate to meaningful learning, and hence to long-term retention.

Results. In four of the six experiments carried out in this series, analysis of variance indicated no significant effects for treatments, although the Active Questions Group consistently obtained lower scores than the Transformations Groups in the short term. In the two experiments where the effects of treatments reached an acceptable level of significance, the direction of results was again in accordance with prediction. In one experiment, both the Active and Provided Questions Groups obtained lower scores than the Transformations Gropps ($p < .05$). In the other experiment, where there was no Provided Questions Groups, the Active Questions Group obtained scores that were significantly lower than those of a Transformations Group ($p < .001$).

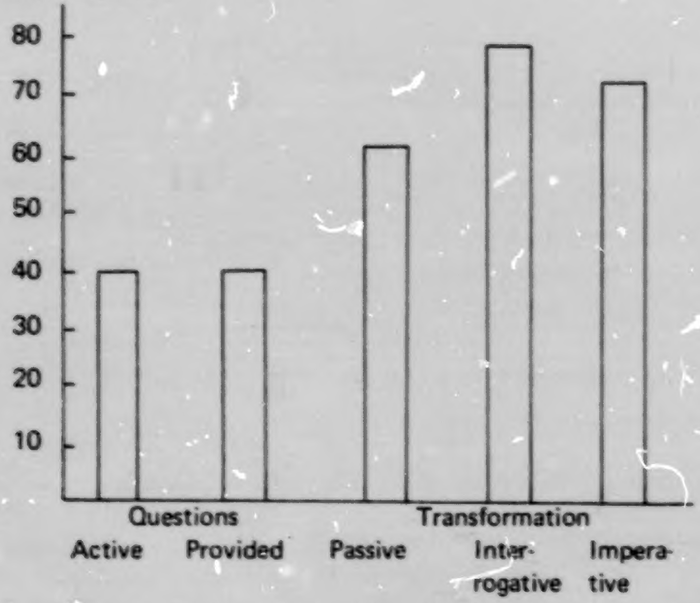
In four of the experiments in this series, the design permitted investigations for the effects of interactions between treatments, form of post-test, and retention interval. In only one of these experiments, the final experiment of the series, were statistically significant interaction effects found. The treatments by form of test interaction was significant ($p < .001$). In this experiment, form of test indicated both retention interval and form with respect to transformation of post-test.

Inspection of means indicates that in the short term, the Active Questions Group obtained higher scores on the untransformed post-test by the other treatments groups.

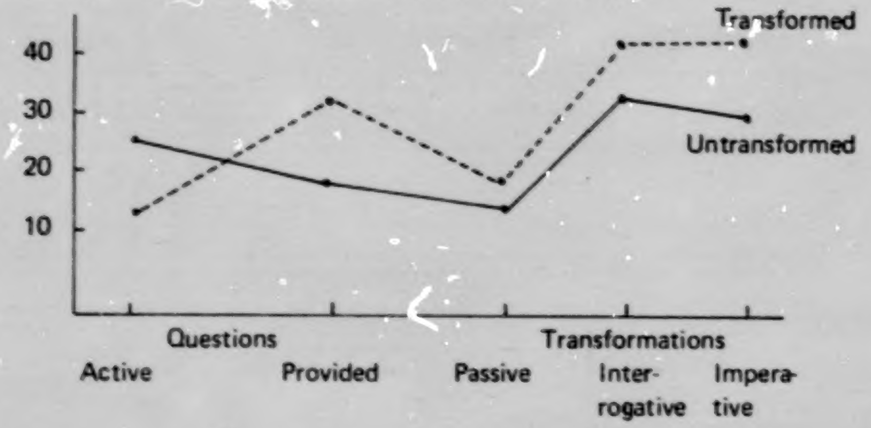
For all except the Active Questions Group, short-term scores were higher than long-term scores ($p < .05$). In the case of the Active Questions Group, there was no significant difference between short-term and long-term scores; and the difference was in fact in the opposite direction.

Summary. With regard to the main problem investigated in this study, the explanation that provided questions assist learning because subjects process information by performing a grammatical transformation into and from the interrogative appears to be adequate. If provided questions had the effect of arousing curiosity, there is nothing here to suggest that this helped learning. Active questions, however, appear to work differently. They are at some disadvantage in the short-term rote-learning situation, but such gains as are made are apparently more permanent and suggest a meaningful-learning approach.

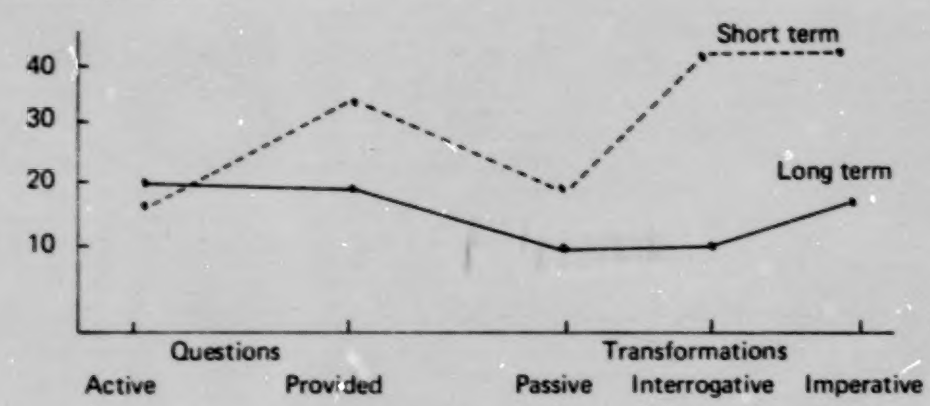
Fig. 9.9. Learning Scores Obtained by Questions and Transformations Groups (High Ability Subjects)



Learning Scores Obtained by Questions and Transformations Groups in the Short term, on Transformed and Untransformed Post-tests (Low Ability Subjects)



Short-term and Long-term Retention Scores Obtained by Questions and Transformations Groups (Low Ability Subjects).



9.3. Overview, Implications and Applications

9.3.1. Problems and Procedure and Interpretation

For experimental purposes, it was necessary to evolve some procedure for eliciting questions; and it may be doubted whether the procedures adopted were completely neutral with regard to the possibility of motivational implications and effects. But assuming that interest aroused by the experimental psychologist's visit was randomly spread across the different experimental treatments, there is other variance to explain, and statistical generalisations about this variance may be considered meaningful.

It is, of course, true that a measure of unreality attaches to laboratory-type situations, and it can be objected that although experiments may be conducted in the classroom, they do not offer more than a rough approximation to classroom teaching. If anything, however, this should add extra weight to findings regarding the usefulness of questions, particularly active questions. Active questions could not be given a full opportunity to demonstrate their special facilitative effects. Question-asking applied more especially to the informal or loosely structured as against the formal and highly structured approach to teaching. But in order to investigate for effects specific to experimental treatments and the prose material used, experimental visits had to be rather formal occasions, with traditional seating arrangements, and silence throughout the experiments. It is often easier for the visitor to secure such conditions than it is for the resident teacher who has to deal with the same pupils day after day in situations where problems and strategies vary considerably.

Clearly then, the acceptance of certain experimental restrictions has been necessary; and from the point of view of applied psychology, particularly educational psychology, this approach may not be regarded as adequate. But before more thorough and extended investigations can be considered, there needs to be some appreciation of the number and character of the variables involved. With regard to questions, particularly active questions, the task remains at the exploratory stage; and what has the appearance of being a major problem has, for the present, to be approached by way of miniature studies.

9.3.2. Summary of findings

In a statement of the principal findings, it may be as well to bear in mind the criticisms that Cronbach (1966) has made regarding a great deal of educational research or of extrapolation from educational research findings. He has suggested that generalisations should take the form,

'With subject matter of this nature,
inductive experience of this type,
in this amount,
produces this pattern of responses,
in pupils at this level of development' (*p.* 79).

If we were to be extremely cautious, and accept Cronbach's suggestion, the findings made in the course of these studies may be stated in the following form,

'With biographical prose material relating to
a young soldier,
and to certain national leaders in the American Civil War,
and with descriptive material relating to Egyptian beliefs and practices,

and with simple sentences set in propositional form,
subjects' own written questions,
interspersed between successive presentations of material,
have been found to help in the completion of sentences from which information
has been omitted,
relating to material offered in the first presentations,
but not in subsequent presentations,
and less efficiently than procedures involving grammatical transformations
unless wider context is available,
in the short term,
but as effectively as these transformation procedures,
and questions provided by the experimenter,
relating to material over all presentations,
in the long term,
for boys and girls,
aged 13 to 16 years,
in the upper and middle ability streams,
of neighbourhood comprehensive schools,
derived from an upper working class population,
in a south of England city.

Perhaps the most important general statement that can be made is that under certain experimental conditions questions, whether active or provided, have been at least as helpful to pupils learning prose material as other methods requiring them to process the material. There appears to be some justification for the existing practice of asking pupils questions regarding matters of fact set within materials provided for study.

But our special concern has been with the effects upon learning that may be expected from the questions that pupils ask. Are pupils' own questions more or less efficient than the possibly more expertly framed questions that are provided by teachers and educationalists? Results of the studies reported here suggest that these active questions can not only be as helpful as provided questions, but under certain conditions *e.g.* when pupils are offered a challenge to their competence, can be more helpful. It looks as if there is a case for overcoming any reluctance that teachers may have at present for using up what appears to be valuable time in permitting, or even encouraging the asking of questions.

Even if it is doubted whether active questions have been shown to exercise a powerful facilitative effect upon learning, there is little to suggest that they contribute towards a diminution in learning efficiency. At first, it looked as if this might be the case, with the finding in the first experiment that with easy prose material, boys and high ability pupils derived less benefit from questioning than from just reading in a given period of time. In the long term, however, the situation improved, and not only were the effects of questions, particularly active questions, found to be favourable with difficult prose, but with easy prose the short-term effect was reversed.

This pattern of improvement in the position of active questions over the long-term appears to have been consistent across the experiments. In this regard, the strong retention interval by treatments interaction reported in Study VI (Successive Presentations: Retention Interval, 9.2.9) is of particular interest. The superiority of provided questions over active questions through a series of presentations in the short term, was completely lost in the long term.

The second thing that can be said is that active questions appear to have worked in a different way from that of provided questions in two respects: (i) The effects of active questions upon learning were probably more sensitive to the influence of motivational factors such as the challenge presented to the competence of pupils. The strength of this challenge would, of course, be partly determined by the ability level of pupils in relation to the material presented, but boys and girls appear to have differed in their response to this challenge. The challenge itself was found to relate more specifically to active questions; and it is in connection with active questions that the greatest directional changes occurred. In Study I (Nature of Material, 9.2.4.), it was with active questions that boys obtained their *lowest* scores with easy prose and their *highest* scores with difficult prose. This did not happen in the case of girls of comparible ability. The sex differences were explained as attributable to the effect of role perception upon the attitudes of pupils towards the task. On this view boys were supposed to be task oriented, and their interest in the task was largely determined by such factors as level of difficulty. Girls, on the other hand, were probably situation oriented and, tending to be more conformist, were motivated to respond suitably, *i.e.* at a near optimum level of interest, to the demands of the experimental situation. (ii) Meaningful learning seemed more likely to occur with active questions. In the rote learning situation, as *e.g.* in the experiments of Study VIII (Questions and Transformations 9.2.11.) where the task involved completing easy sentences which were transformed or untransformed, active questions were at a disadvantage. Furthermore, in the experiments of Study VII (Advance Preparation and Wider Context, 9.2.10.), primacy and recency effects, or a pattern of results over presentations that resembles them, were sharper for provided questions than for active questions; and this was in the situation where subjects were carefully prepared, and where presumably the special effects of the two different treatments might be expected to show.

With regard to answers to questions, results do not offer a clear pattern. This is probably due to lack of specificity in the feedback procedure. Strictly speaking, pupils did not receive feedback on their questions because there was no evidence to them that the information which came through the full passages provided in the experiments of Studies I to VI, the context provided in Study VII, and the full sentences in the experiments of Study VIII, was directly given in answer to their questions. The pupils could not feel that their questions had brought the information. Their questions did not have any control over the information-giving procedure. In the final experiment of Study VII (Advance Preparation and Wider Context, 9.2.10.) where pupils received greater help from the context coming after the text material than from the context coming before material, it is possible that the older and higher pupils who took part, were better able to relate text to context. On the other hand, the higher scores obtained by pupils when they asked questions, may be interpreted as indicating that they found the context more useful when asking questions, and that its usefulness lay in the fact that it acted to provide feedback to their questions.

9.3.3. Practical Applications: Pedagogical

Although caution is appropriate when attempting to extrapolate from results of the kind of experiment reported in these studies, the pattern of findings seems to suggest that even if theoretical generalisations are dangerous, attempts at practical application will not be.

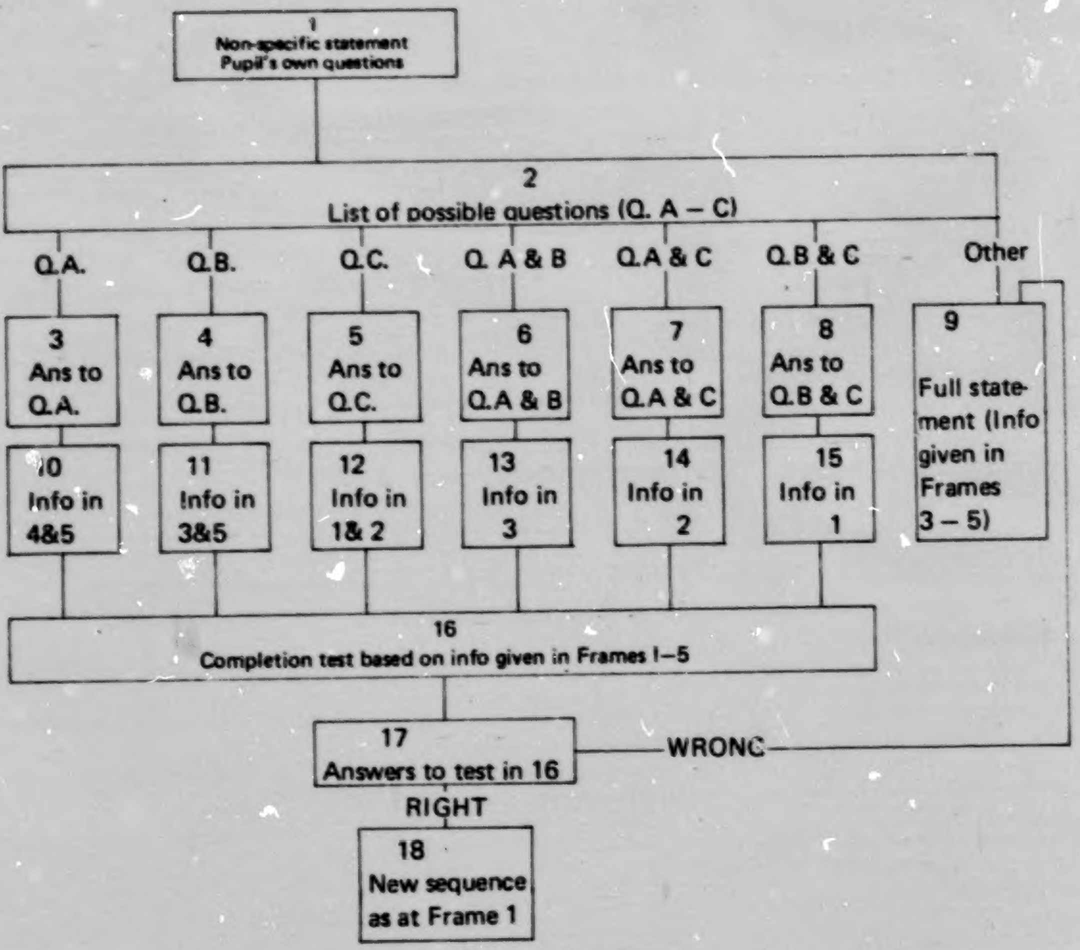
The first general conclusion was that questions, whether active or provided, can be at least as helpful as other methods requiring pupils to process material which has been presented to them for study. As far as provided questions are concerned, it seems that results are consistent with the findings of Rothkopf and Frase, reported earlier (9.1.1.). However, no attempt has been made in the present studies at replication of their work relating to the location of provided questions, and to differences in the effects of questions upon learning question-irrelevant and question-relevant information. The results of experiments in Studies V – VII (Successive Parsentations – Relevant Active Questions and Retention Interval; Advance Preparation and Wider Context) are also consistent with the position adopted by Ausubel (1963) regarding reception learning. The carefully structured teaching situation, where information is organised and presented taking account of the existing apttern of the pupils' knowledge and experience, offers good prospects of meaningful learning. Provided questions, which are formulated by the teacher, appear to lend themselves more readily to this organisational procedure; and this has been recognised by those responsible for writing textbooks and teaching programmes.

The problem arises whether active questions can also be incorporated into well structured teaching probrammes, assuming of course that it is desirable to do so. Teachers are often under pressure of time. Rightly or wrongly, there are syllabus requirements and examinations to be considered. For this reason, it is possible to be discouraged if the benefits of active questions are not always immediately apparent. A reluctance to go ahead may be overcome if it is accepted that in the long run, active questions are certainly at no disadvantage, and that even in the short term, under conditions where a challenge is presented to the competence of pupils, or if a wider context is offered relating to the syllabus material, active questions can be helpful. Of course, it is the long-term position with which educationalists are concerned, and there is the further possibility that questions, whether active or provided, may prove to be useful for other reasons, in the classroom as a social situation. In addition to this, as *e.g.* Blank and Covington (1965) found, question-asking behaviour can be elicited in children, and skill in question-asking may be expected to improve with practice.

Procedures followed in the experiments of Study VII (Advance Preparation and Wider Context, 9.2.10), suggest how active questions may be incorporated into carefully organised teaching situations. Prose may be broken down into a number of information-bearing items, and a basic division between text and context determined upon. The problem then arises regarding the aims of teacher and pupil. These do not necessarily coincide. The teacher may want the pupil to learn the text. The pupil may be interested in selected portions of the context. Assuming that the teacher is right, his task becomes that of leading the pupil to an understanding of the text by means of his excursions into the context. Having itemised information in the context, the teacher then prepares an exhaustive list of questions corresponding to those items. It becomes a matter then of organising the output of answers, or library of answers, so that these can come as feedback to the pupil's questioning. The teacher then has the difficult task of monitoring the pupils 'discoveries', so that in the more formal teaching situations, these may act as anchoring points for the basic information which it is felt that the pupil should acquire.

A carefully programmed text might be usefully linked to the class library. Frames could offer pupils a choice of methods by which to learn material, and the possibility of changing from one method to the other. In a typical frame, the pupil may

The following flow chart is suggested for a programme incorporating active questions:


1
Non-specific statement
Pupil's own questions
2
List of possible questions (Q. A – C)
Q.A.
Q.B.
Q.C.
Q. A & B
Q.A & C
Q.B & C
Other
3
Ans to Q.A.
4
Ans to Q.B.
5
Ans to Q.C.
6
Ans to Q.A & B
7
Ans to Q.A & C
8
Ans to Q.B & C
9
Full statement (Info given in Frames 3 – 5)
10
Info in 4&5
11
Info in 3&5
12
Info in 1& 2
13
Info in 3
14
Info in 2
15
Info in 1
16
Completion test based on info given in Frames 1–5
17
Answers to test in 16
WRONG
RIGHT
18
New sequence as at Frame 1

1 – 18 Frame nos.
Q Question
Info Information

be asked by which route he wishes to approach the topic at any given stage. Alternatives such as question-answering, question-matching or choosing, reading, or clue-solving, could be offered. The pupil would then turn to the appropriate frame. Question-matching or choosing may be the nearest practicable approach to question-asking. Subjects can write their own questions, and then match these with questions offered in the programme. On the other hand, they may simply choose those questions to which they would like to have the answer. For the link to the class library to be established, much of the available information would have to be itemised and related to the programme. This kind of task would be better performed at the text-book production level.

At a less sophisticated level, it may be possible for the individual teacher to use a given text-book, decide upon the basic required text and elaborating context, and arrange a series of lessons where pupils spend some time writing their questions. In a formal session pupils' questions are listed, and the elaborating context is presented to the pupils as a group, to the extent that it gives answers to their questions. At the same time, the basic required text can be presented in relation to the context.

Pupils are offered the non-specific statement in the first frame and invited to ask questions for further information. The second frame offers a limited range of possible questions – in this case three questions – and pupils are asked to see whether any of their questions are included. With three questions, A, B and C, eight possibilities are considered: (i) None of their questions is included (ii) all three questions correspond to their own questions (iii) question A corresponds (iv) Question B corresponds (v) Question C corresponds (vi) Questions A and B correspond (vii) Questions A and C correspond (viii) Questions B and C correspond. Information is then given to pupils in two stages, firstly as answers to the questions that correspond to their own questions, secondly as statements offering information they would have received if they had asked and received answers to all three questions. Groups (i) and (ii) above are simply given the full statement. A completion test is incorporated in the programme sequence together with a rehearsal loop for pupils who give incorrect answers.

If it is felt that the range of possible questions is too limited, this can be dealt with in a fresh sequence, or pupils could be taken one by one through the longer list of qeustions before being finally brought to the full statement. If the pupil has not, for example, asked question A, he goes to question B. If he has asked question A, he inreads the answer to A and then goes to question B. The offering of supplementary information to ensure that all pupils receive all of the information available, will be rather more complicated in this case, if some distinction is to be made between information coming as feedback to pupils' own questions and information contained in answers to the widest range of questions.

9.3.4. Practical applications: Further Research

A number of research problems relating to the learning based on question-asking remain to be investigated. These may be stated in qeustion form. (i) Are there forms of prose material which lend themselves more readily to question and answer processes? (ii) Does poetry, as opposed to prose raise any special difficulty? (iii) Does the vocalisation required by spoken questions offer any special advantage? (iv) Is it possible in the short term to sustain the advantage of active questions over a series of presentations? (v) Is there any relationship between the type of question asked by pupils, and the extent to which their questions facilitate learning and retention? (vi) If pupils are trained in question-asking, will the advantages of question-asking be more pronounced? (vii) Are there norms for level of difficulty presenting an optimal challenge relating to the ages and measured ability level of pupils? (viii) Will different results be obtained from different types of school? (ix) Are there sub- and cross-cultural differences? (x) If pupils work together in groups, will their questions be more effective? (xi) Is is possible to devise teaching programmes effectively incorporating questions which will function as active questions for subjects?

It is probable that this kind of research will best be conducted by teachers interested in the development of effective intervention programmes. Results along each particular line of research would need to be watched over a much longer period than has been possible in the studies reported here. Perhaps it should also be stressed that in view of findings suggesting that active questions are certainly not less helpful than provided questions, this is research that may be safely and profitably undertaken.

9.3.5. Summary

Questions were labelled *active* when framed by pupils, and *provided* when offered to pupils as problems requiring solution. The chief problem has been that of isolating the effects of provided questions.

A number of studies investigating the effects of provided qeustions are mentioned in the literature. The variables of location, frequency, contiguity, long-term retention and incentive, have been studied in connection with provided questions, particularly in relation to Rothkopf's mathemagenic or inspection behaviour hypothesis. Post-questions had been found to offer greater facilitative effects than pre-questions, and it was suggested that questions following one presentation provided a test-taking orientation for subsequent presentations. Pre-questions appeared to have had an interfering effect by concentrating the attention of subjects upon particular points. When questions were frequently interspersed between passages of prose material, the difference between pre- and post-questions favouring post-questions, was more pronounced. The inhibiting effect of pre-questions could be carried forward by means of rehearsal. The advantage of post- over pre-questions was diminished when incentives were given. The long-term effects of provided questions apparently followed the short-term pattern.

The main difficulty with the provided questions experiments appears to be that questions do not arise from the passages being studied. They are used as modes of rehearsing points within passages, and are possibly no more than restatements of information in interrogative form.

Useful studies investigating the effects of active questions appear to be rare because of a practical difficulty arising from the fact that procedures used to elicit questions almost invariably have their own effects upon the learning and retention of material.

In the course of project studies, the effects of the following variables upon learning and remembering were investigated:-

(i) Provided questions – These were questions framed by the experimenter and usually required answers.
(ii) Active questions – These were the pupils' own questions.
(iii) Active and provided questions combined.
(iv) Relevant active questions – These were questions framed by the pupils, and compared with provided answers.

(v) Reading, single – Pupils read only the text material.

(vi) Reading, split – Pupils read the text material after having read a non-specific summary.

(vii) Clue solving – Pupils tried to supply a given word when offered a clue.

(viii) Passive, interrogative and imperative transformations – Sentences to be learned were transformed into passive, interrogative and imperative forms respectively.

(ix) Form of test – Post-test sentences either correspond to the text to be learned, or were transformed into the passive.

(x) Difficulty of material

(xi) Task timing

(xii) Retention interval

(xiii) Presentations – Pupils were exposed to successive presentations of similar text material.

(xiv) Advance preparation

(xv) Availability of context

(xvi) Sex of pupils

(xvii) Ability level of pupils

In these studies, the dependent variables were:

(i) Criterion scores on a completion task – In the post-tests, pupils were required to complete sentences from which words had been omitted. The number of sentences completed correctly was taken as a measure of learning and retention.

(ii) Pattern of scores over presentations – The post-tests were divided into sections corresponding to each of the presentations of material. Scores on these sections could differ systematically.

(iii) Inspection and study time – When tasks were self-paced, the amount of time spent by pupils in reading and studying the different experimental materials was recorded.

(iv) Writing time – When tasks were self-paced, the amount of time taken by pupils to write their own questions or give answers to provided questions was recorded.

(v) Number of questions asked.

Questions, whether active or provided, were found to be at least as helpful to pupils learning prose material as other methods requiring them to process the material. Active Questions were more helpful than a control, clue-solving task, when context material was also provided.

Difficulty of material and ability level of pupils appeared to determine the strength of the challenge presented by a learning task, and hence the tendency to benefit from active questions. Boys and girls responded differently to this. Boys were more sensitive to the level of challenge to their competence, deriving more help from active questions when the material was comparatively more difficult.

Retention interval operated differently for active and provided questions. Whereas the benefits of provided questions were apparent in the short term, this was not always the case with active questions, although in the long term, they were equally halpful.

There was some evidence for supposing that pressure of time in the learning situation itself was also relevant. When time available to pupils was limited, there was a tendency to use rote-learning strategies; and this operated to the disadvantage of active questions.

With regard to presentations, meaningful differences could be observed in the pattern of results, and it appeared that the mathemagenic behaviour (*e.g.* inspection, study and writing time) of low ability boys at least could be modified by the use of active, particularly relevant active questions.

Some difficulty was experienced in the procedure to operationalize relevance, and results regarding the effects of feedback were inconclusive; but the position of context, whether before or after related text, appeared to be important. Higher scores were obtained by pupils when context was provided after the text, and it seems probable that in this case the context acted to provide feedback to their questions.

Active questions appear to have been helpful under certain conditions, and although further research in depth is warranted, the indications are that careful application of results already obtained could prove fruitful.

9.4. References

Ausubel, D.P. *The psychology of meaningful verbal learning.* New York: Grune & Stratton, 1963.

Ausubel, D.P. *Educational psychology. A cognitive view.* New York: Holt, Rinehart & Winston, 1968.

Ausubel, D.P. Schpoont, S.H., & Cukier, L. The influence of intention on the retention of school materials. *J. educ. Psychol.* 48, 87–92, 1957.

Blank, S.S., & Covington, M. Inducing children to ask questions in solving problems. *J. educ. Res.* 59, *1*, 21 – 27, 1965.

Brown, J. Short-term memory. *Br. med. Bull.* 20, *1*, 8 – 11, 1964.

Bruner, J.S. The act of discovery. *Harvard educ. rev.* 31, 21 – 32, 1961.

Bruner, J.S. Some elements of discovery. In Shulman, L.S., & Keislar, E.R. (Eds). *Learning by discovery.* Chicago : Rand McNally, 1966.

Chomsky, N. *Syntactic structures.* The Hague : Moulton, 1957.

Crandall, V.J., & Rabson, A. Children's repetition choices in an intellectual achievement situation following success and failure. *J. genet. Psychol.* 97, 161–68, 1960.

Cronbach, L.J. The logic of experiments on discovery. In Shulman, L.S., & Keislar, E.R. (Eds). *Learning by discovery.* Chicago : Rand McNally. 1966.

Dewey, J. *Democracy and education.* New York : Macmillan, 1916.

Fahey, G.L. The extent of classroom questioning activity of high-school pupils and the relation of such activity to other factors of pedagogical significance. *J. educ. Psychol. 33,* 128–137, 1942 (a).

Fahey, G.L. The questioning activity of children. *J. genet. Psychol. 60,* 337–357, 1942 (b).

Finley, C.W. Some studies of children's interests in science materials. *School sci. Math. 11,* 1–24, 1921. (Cited in Fahey, 1942).

Frase, L.T. Learning from prose material: length of passage, knowledge of results, and position of questions. *J. educ. Psychol., 58,* 266–272, 1967.

Frase, L.T. Some data concerning the mathemagenic hypothesis. *Am. educ. res.* J., 5, *2,* 181–189, 1968 (a).

Frase, L.T. Effect of question location, pacing, and mode upon retention of prose material. *J. educ. Psychol., 59,* 244–249, 1968 (b).

Frase, L.T., Patrick, E., & Schumer, H. Effect of question position and frequency upon learning from text under different levels of incentive. *J. educ. Psychol.,* 61, *1,* 52–56, 1970.

Hasler, J.O., & Smith, R.E. *The teaching of secondary mathematics.* New York : Macmillan, 1930.

Helseth, I.O. Children's thinking. *Publ. Teach. Coll.,* No. 209. Columbia Univ. (cited in Fahey, 1942), 1926.

Hershberger, W.A., & Terry, D.F. Typographical cueing in conventional and programmed tests. *J. appl. Psychol., 49,* 55–60, 1965 (a).

Hoetker, J. Teacher questioning behaviour in nine junior high school English classes. *Res. Teach. Eng.,* 2, *2,* 99–106, 1968.

Homans, G.C. *The human group.* London : Routledge, 1951.

Johnson-Laird, P.N. The interpretation of the passive voice. *Quart, J. exp. Psychol.,* 20, *69,* 1968.

Kagan, J. Learning, attention and the issue of discovery. In *Learning by discovery.* Shulman, L.S., & Keisler, E.R. (Eds). Chicago : Rand McNally, 1966.

Kay, H., Dodd, B., & Sime, M. *Teaching machines and programmed instruction.* Harmondsworth : Pelican, Penguin, 1968.

McClelland, D. *The achievement motive.* New York : Appleton–Century-Crofts, 1953.

Mehler, J. Some effects of grammatical transformations on the recall of English sentences. *J. verb. Learn. verb. Behav., 2,* 250, 1963.

Moriarty, A. Coping patterns of preschool children in responses to intelligence test demands. *Genet. Psychol. Monogr., 64,* 3–127, 1961.

Patrick, E.M. Prose learning: induced question and response rehearsal and question repetition. Unpublished manuscript. University of Massachusetts (In Frase, 1970), 1968.

Peeck, J. Effect of prequestions on delayed retention of prose material. *J. Educ. Psychol.,* 61, *3,* 241–246, 1970.

Rothkopf, E.Z. Some theoretical and experimental approaches to problems in written instruction. In *Learning and the Educational process.* J.D. Krumboltz (ed.) Chicago : Rand McNally, 193–221, 1965.

Rothkopf, E.Z. Textual constraint as function of repeated inspection. *J. educ. Psychol.* 59, *1,* 20–26, 1968.

Rothkopf, E.Z., & Bisbicos, E.E. Selective facilitative effects of interspersed questions on learning from written materials. *J. educ. Psychol.* 58, 56–61, 1967.

Rowell, J.A., Simon, J., & Wiseman, R. Verbal reception, guided discovery and the learning of schemata. *Br. J. educ. Psychol.* 39, *3,* 233–244, 1969.

Savin, H.B., & Perchonock, E. Grammatical structure and the immediate recall of English sentences. *J. verb. Learn. verb. Behav.* 6, 348, 1965.

Shulman, L.S. & Keislar, E.R. (eds). *Learning by discovery.* Chicago : Rand McNally, 1966.

Smock, C.D., & Holt, B.G. Children's reactions to novelty: an experimental study of curiosity motivation. *Child Dev.,* 33, 631–42, 1962.

Symonds, P.E. *Education and the psychology of thinking.* New York : McGraw-Hill.

Umstattd, J.G. *Secondary school teaching.* Boston : Ginn, 1939.

Waugh, N.C. & Norman, D.A. Primary memory. *Psychol. Rev.* 72, 89–104, 1965.

Wesley, E.B. *Teaching and social studies.* New York : Heath, 1937.

Wood, G. Higher order memory units and free recall learning. *J. exp. Psychol.* 80, 286–88. 1969.

Woodworth, R.S. *Dynamic psychology.* New York : Columbia Univ. Press, 1922.

Wright, P. Transformations and the understanding of sentences. *Language and speech.* 12, *3,* 156–66, 1969.

APPENDIX : STUDY V (9.2.8)

A fuller report of the procedure used in Study V offered as an illustration of the methods and techniques used in the studies investigating active questions.

Method

Subjects

The subjects were forty eight boys and girls, aged thirteen to fourteen years, taken from the upper two of five streams corresponding to ability and attainment in a neighbourhood comprehensive school.

Materials

A passage of moderately difficult prose was taken from the life of Alexander Hamilton in 'Men of America' by Lionel Elvin. The passage, of approximately 900 words in total length, was divided into six paragraphs of approximately 150 words each. Corresponding to these full paragraphs, non-specific paragraphs were prepared. The non-specific paragraph was a shorter version of the full paragraph, and was prepared in such a way as to suggest gaps in information. Pronouns were used instead of names; adjectival or adverbial qualities were not specified; and events were referred to in general and indefinite terms. Gaps in information would be filled by the full paragraph. If all the full paragraphs were read together, they formed a continuous whole passage.

Six lists of questions were devised by the experimenter, and related to points in the non-specific paragraphs were further information was needed in order to make complete sense. All the questions could be answered from the full paragraphs but not from the non-specific paragraphs. These lists were the provided questions. Lists of answers to these questions were also prepared.

A brief pre-test comprised five sentences which subjects familiar with the topic might be expected to complete without difficulty.

The post-test took the form of six paragraphs from each of which ten words of high information content were excluded. This was accompanied by a list of these words presented in alphabetical order. Instructions at the head of the test sheet included the words, 'Read the TEST WORD LIST. Using words from the WORD LIST, fill as many blanks as possible. Some words can be used more than once'.

The above materials, excluding the post-test, were bound together in personal folders for each subject. Rubber bands held the sheets face downwards; and instructions were given that only one sheet was to be released and turned at a time.

A special clock was constructed in order to make it possible for subjects to record the time to the nearest five seconds, at which they began and at which they finished each successive task. Its mechanism was that of a domestic pendulum clock, usually placed upon a mantelpiece. The pendulum weight was removed so that the minute hand completed one revolution in 15 minutes. A special face was cut from white perspex. 24 inches in diameter, and letraset figures 1½ inches in length indicated units of time in fives from 5 to 180. Intervals of one unit of time, approximately equivalent to 5 seconds, were indicated by lines, etched to a length of ½" and filled with black paint. The hour hand was removed, but an aluminium extension was made to the minute hand and covered with black paint.

Procedure

Subjects were assigned to three treatment groups, matched for sex and verbal ability. Information regarding reading age and scores on the Raven's Standard Progressive Matrices test was available from the school. It was felt that the matching procedure should be based on the reading age result which appears to be more relevant when considering performance on a verbal learning task. However, when cell means were afterwards calculated by using both systems of matching, *viz.* four subjects per cell, matched on reading age, and three subjects per cell, matched on Matrices score, a highly significant correlation ($r = .916$, $p < .001$) was found.

The three treatment groups were:—

1. *Relevant Active Questions.* Subjects first read non-specific paragraph No. 1, then wrote their own questions about the paragraph. They were instructed,

'Look back at the NON-SPECIFIC PASSAGE. In order to make sense of it, there are things you need to know. Write as many questions as you can about the passage. You may write on both sides of this sheet'.

Subjects were then required to check the list of experimenter's answers, corresponding to the first non-specific paragraph. Instructions were,

'Check this list of answers and underline the ones which answer your OWN QUESTIONS. Underline any of your own questions not answered here'.

Subjects then read the full paragraph.

This procedure was repeated for the remaining paragraphs 2 – 6, and subjects were then required to re-read all the full paragraphs, before asking for the post-test.

2. *Active Questions.* After reading the non-specific paragraph and writing their own questions, subjects read the full paragraph. They were then instructed,

'Put the NON-SPECIFIC PASSAGE (NSP.1 to 6) and the FULL PASSAGE (FP.1 to 6) side by side, and underline all the new facts given in the FULL PASSAGE'.

The rest of the procedure for this group was the same as for the active questions treatment group.

3. *Provided Questions.* After reading the non-specific paragraph, subjects read the full paragraph. Then they wrote answers to questions provided by the experimenter. These answers were then checked against the experimenter's list of answers, subjects underling all correct answers. The rest of the procedure for this group was the same as for the other treatment groups.

Subjects were allowed to work in their own time. As they began and completed each page, they were required to make a note of the time indicated on the special clock. A brief training period sufficed to make subjects familiar with the clock face. Subjects began and finished the pre-test together. When subjects had completed re-reading all the full paragraphs, they were instructed to signal to the experimenter that they had done so, and they were immediately given the post-test. This was also completed in their own time.

Treatment of Results

Scoring Procedure. At least four methods of scoring seemed possible:

(i) A raw score, *i.e.* where subjects used the exact word which had already been decided upon by the experimenter and which had been included in the list of words supplied to subjects.

(ii) A transformed response score, *i.e.* where, as in the case of the raw score, subjects used the exact word, but where the blanks to be filled occurred in sentences or phrases involving an active-passive transformation.

(iii) A difference score, *i.e.* the raw score corrected by the subtraction of the pre-test score.

(iv) A gross corrected score, *i.e.* the difference score corrected by the addition of responses which, though not taken from the list of words supplied to subjects, were not incorrect.

Spearman's rank-order coefficient of correlation was obtained for cell means using all four methods of scoring.

Table A9.1 Rank Correlations among Different Scoring Procedures

Type of Score	Type of Score			
	(i) Raw	(ii) Transformed	(iii) Difference	(iv) Corrected
(i) Raw	x			
(ii) Transformed	.888	x		
(iii) Difference	.990	.867	x	
(iv) Corrected	.911	.867	.906	x

N = 60

In all cases the coefficient of correlation (rho) was highly significant ($p < .001$).

In view of evidence suggesting that subjects misunderstood instructions regarding the pre-test, it was felt that it would be safer to assume that familiarity with the topic was randomly distributed throughout the groups. The raw score, was, therefore, used to indicate the criterion for learning and retention. The transformed response score served to give further information which could also be treated statistically.

X^2's were calculated on data set in contingency tables and grouped by number of subjects for whom correct transformed response scores formed more or less than fifty per cent of total raw scores. Treatment groups were separated in three ways: (a) three treatments (b) Relevant Active Questions compared with the remaining two groups (c) Provided Questions compared with the remaining two groups.

Three-way analysis of variance was operated on the square root transformation of the raw scores:

Treatments by Reading Ability by Sex (3 x 2 x 2)

Means were compared and tested against the within-cell variance term. There were four replicates to each cell.

Raw scores obtained on the first presentation were analysed separately, using a single-factor design on the three treatments. Means were compared and tested against the within treatments variance term.

A single-factor analysis of variance was operated on difference scores calculated by subtracting scores obtained on the first presentation from scores obtained on the second presentation. Means were compared and tested against the within treatments variance term.

Correlation coefficients were calculated for each of the twelve experimental groups (*i.e.* High and Low Reading Ability boys and girls for the three treatments) with the rank order of presentations one to six.

Further analysis was suggested by results of the calculation of correlation coefficients, *viz.* analysis of linear trend

(a) Considering the three treatments, boys only; High and Low Reading Ability.

(b) Considering the one treatment, Relevant Active Questions; boys and girls; High and Low Reading Ability.

Comparison was made by t-test between treatment groups with regard to writing time, after an F test to establish that the pooling of variance was permissible.

Three-way analysis of variance was operated on the number of questions asked by subjects in the Active Questions and Relevant Active Questions Groups for treatments by Reading Ability by Sex (2 x 2 x 2).

Correlation coefficients were calculated for the two Active Questions Groups between number of questions asked and scores obtained.

Results

(i) Scores

The analysis of variance (Table A9.2) indicated a significant Sex by Reading Ability interaction (p <.05). With girls, High Ability subjects obtained higher scores than Low Ability subjects, whereas the slight difference for boys favoured the Low Ability subjects. This difference in direction in the case of boys was wholly attributable to the Relevant Active Questions group. This treatment group obtained significantly lower scores (p <.05) than Provided Questions subjects in the case of High Ability boys, but the difference for Low Ability boys was slight. None of the differences between treatments for Low Ability boys was significant.

Table A9.2 Sources of Variance in Learning Scores by Reading Ability, Sex and Question Treatment

	Sum squares	df	Mean square	F	p	F'
Reading Ability (RA)	2.50	1	2.50	3.16		<1
Treatments (QAR, QA, AP)	10.15	2	5.08	6.43	<01	1.40
Sex	0.02	1	0.02			
Treatments by RA	1.45	2	0.73			
RA by Sex	3.62	1	3.62	4.58	<05	
Treatments by Sex	1.13	2	0.57			
Treatments By RA by Sex	0.40	2	0.20			
Within Cell	28.69	36	0.79			
Total	47.96	47				

Key:

QAR	Relevant Active Questions
AQ	Active Questions
AP	Provided questions
F'	F values when tested against the RA by Sex interaction mean square

Table A9.3 Comparison of Mean Scores (square root transformations) obtained by subjects under Relevant Active Questions, Active Questions, and Provided Questions Treatments

	QAR	QA	AP	t	p
All Groups	3.13	3.61		1.55	ns
	3.13		4.26	3.64	<.001
		3.61	4.26	2.10	<.05
High Reading	3.12	3.99		1.98	<.10
Ability	3.12		4.57	3.29	<.01
		3.99	4.57	1.32	ns
Low Reading	3.15	3.23			ns
Ability	3.15		3.94	1.80	<.10
		3.23	3.94	1.62	ns
Boys	3.10	3.78		1.55	ns
	3.10		4.05	2.16	<.05
		3.78	4.05		ns
Girls	3.17	3.44			ns
	3.17		4.46	2.93	<.01
		3.44	4.46	2.77	<.01
High Reading	2.77	3.80		1.64	ns
Ability Boys	2.77		4.23	2.32	<.05
		3.80	4.23		ns
High Reading	3.48	4.18		1.11	ns
Ability Girls	3.48		4.92	2.30	<.05
		4.18	4.92	1.17	ns
Low Reading	3.42	3.76			ns
Ability Boys	3.42		3.88		ns
		3.76	3.88		ns
Low Reading	2.87	2.69			ns
Ability Girls	2.87		4.00	1.79	<.10
		2.69	4.00	2.08	<.05

QAR	Relevant Active Questions	QP	Provided Questions
QA	Active Questions	RA	Reading Ability

t values less than 1.00 are not given

When the effects of treatments were tested against the Sex by Reading ability interaction term, they did not reach an acceptable level of significance. Tested against the within-cell error variance term, the main effects would have been significant, (F = 6.43; df = 2.36; p <.01) and comparison of means shows that Provided Questions gave higher scores than Relevant Active Questions (p <.001) and Active Questions (p <.05). The difference between the two Active Questions treatment groups was not significant. Although means were compared without the warrant of main treatments effects, the direction of results should be noted because they go contrary to prediction.

Differences between Provided Questions and the Active Questions Groups were more pronounced in the case of girls (p<.01) than with boys; with High Reading Ability subjects than with Low Ability subjects. With regard to scores obtained in that part of the post-test which corresponded to the first presentation, analysis of variance (Table A9.4) indicated significant between treatments effects (p <.05). Comparison of means (Table A9.5) shows that the Active Questions Group obtained higher scores than the Relevant Active Questions Group (p <.05), and also that they obtained higher scores than the Provided Questions group (p <.05). Note that this result goes contrary to that found for scores over all six presentations.

Table A9.4. Summary of Analysis of Variance. Treatments effects on First Presentation.

Source of Variance	Sums of Squares	df	Mean Square	F	P
Between treatments	26.54	2	13.27	3.80	<.05
Within treatments	156.94	45	3.49		
Total	183.48	47			

Table A9.5. Comparison of Mean Scores Obtained by Subjects under Relevant Active Questions (QAR), Active Questions (QA), and Provided Questions (QP) Treatments, for first presentation.

QAR	QA	QP	t	p
0.38	2.18		2.73	<.05
0.38		0.84		ns
	2.18	0.84	2.03	<.05

When analysis of variance was operated on difference scores obtained by subtracting scores on the first presentation from scores on the second presentation, significant between treatments effects were found (Table A9.4). Comparison of means (Table A9.5) shows that the greatest improvement between the two presentations was made by the Relevant Active Questions Group. They obtained higher difference scores than Active Questions (p <.01), and Provided Questions (p <.05, one-tailed test).

Table A9.6. Summary of Analysis of Variance. Difference Scores. Scores on First Presentation subtracted from Scores on Second Presentation. Treatments: QAR, QA, QP.

Source of Variance	Sum of Squares	df	Mean Square	F	p
Between treatments	33.17	2	16.58	3.45	<.05
Within treatments	216.31	45	4.81		
Total	249.48	47			

Table A9.7 Comparison of Means of Scores obtained by Subjects under QAR, QA and QP Treatments – Difference between First and Second Presentations.

QAR	QA	QP	t	p
2.31	0.22		2.68	<.01
2.31		1.03	1.64	
	0.22	1.03	1.04	ns

When data were grouped in contingency tables by number of subjects for whom correct transformed scores formed more or less than fifty per cent of the total scores, significant X^2 values were found for the comparisons between treatments. A greater proportion of the Relevant Active Questions subjects obtained fifty per cent and over, when compared with the other treatment groups taken together ($X^2 = 5.27$, $p < .025$). A greater proportion of the Provided Questions Group obtained less than fifty per cent when compared with the other treatment groups ($X^2 = 3.37$, $p < .1$) (Tables A9.8, 9 and 10).

Table A9.8. Proportion of Scores relating to the transformed Sentences or Phrases in the Post-Test. Three Treatments Compared.

	QAR	QA	QP	Total
50% and over	15	11	9	35
under 50%	1	5	7	13
Total	16	16	16	48

$X^2 = 5.99$ $p = .05$

Table A9.9. Proportion of Scores relating to the Transformed Sentences or Phrases in the Post-test. QAR Compared with remaining Treatments.

	QAR	QA/QP	Total
50% and over	15	20	35
under 50%	1	12	13
Total	16	32	48

$X^2 = 5.27$ $p < .025$

Table A9.10. Proportion of Scores relating to the Transformed Sentences or Phrases in the Post-test. QP Compared with Remaining Treatments.

	QAR/QA	QP	Total
50% and over	26	9	35
under 50%	6	7	13
Total	32	16	48

$X^2 = 3.37$ $p < .1$

(ii) Inspection Times

Coefficients were calculated to indicate the strength of the negative correlation between total study time (including both writing and inspection tasks) and presentations. It was found (Table A9.11) that the smallest coefficients occurred for Low Ability boys (r = –.21, p >.25) under the Relevant Active Questions treatment and low Ability girls (r = –.30, p <.25) under the Active Questions treatment. Negative correlations, indicating decline of total study time over successive presentations, were significant for all other experimental groups except Low Ability girls in both the Relevant Active Questions Group and the Provided Questions Group. (In both cases, r = –.36, p <.10).

Table A9.11. Correlations of Total Inspection Times with Order of Presentations (N = 24)

	r	t	p
Relevant Active Questions			
High Reading Ability			
Boys	–.64	3.89	<.001
Girls	–.67	4.25	<.001
Low Reading Ability			
Boys	–.21	1.01	ns
Girls	–.36	1.81	<.10
Active Questions			
High Reading Ability			
Boys	–.47	2.50	.02
Girls	–.39	1.99	.05 approx.
Low Reading Ability			
Boys	–.38	1.94	.05 approx.
Girls	–.30	1.47	.25
Provided Questions			
High Reading Ability			
Boys	–.51	2.79	.01
Girls	–.40	2.04	.05
Low Reading Ability			
Boys	–.63	3.25	.01
Girls	–.36	1.81	.10

Negative correlations indicate decline of study time over successive presentations.

When the three treatments for High and Low Ability boys were considered, the analysis of linear trend indicated highly significant linear effects for presentations but no significant interactions occurred (Talbe A9.12). An examination of the variance of linear trend was nevertheless carried out, and it was found that the smallest deviation from zero occurred in the case of Low Ability boys under the Relevant Active Questions treatment (p <.25). The only other case of a non-significant deviation from zero occurred for High Ability boys with the Active Questions treatment, and here the p value was less than .10. In the absence of an interaction effect, however, no suggestion is made here that the difference between the variance of linear trend for these groups is significant.

Table A9.12. Analysis of Linear Trend. Total Study and Inspection time. Successive Presentations. Three Treatment Groups: Relevant Active Questions; Active Questions; Provided Questions. High and Low Reading Ability boys.

	Sum of Squares	df	Mean Square	F	p
Within subjects (linear)	*544.01*	*24*			
Presentations (linear)	341.10	1	341.10	35.05	<.001
Reading Ability (RA) by presentations (linear)	1.20	1	1.20		
Treatments by presentations (linear)	19.00	2	9.50		
Treatments by (RA) by presentations (linear)	7.51	2	3.76		
Presentations by subjects within groups (linear)	175.20	18	9.73		

A somewhat similar result was found when analysis of linear trend was undertaken for the one treatment, *viz.* Relevant Active Questions, for High and Low ability boys and girls (Table A9.13). Highly significant linear effects were found for presentations, but there were no significant interactions. Examination of the variance of linear trend (Table A9.14) again shows that whereas in the case of all other experimental treatment groups the deviation form zero was significant, for Low Ability boys it was not. (p <.25) (Table A9.15).

Table A9.13. Analysis of Linear Trend. Total Study and Inspection Time. Successive Presentations. Relevant Active Questions Treatment Group. High and Low Reading Ability boys and girls.

	Sum of Squares	df	Mean Square	F	p
Within subjects (linear)	*12579.08*	*16*			
Presentations (linear)	7738.51	1	7738.51	23.89	<.001
Reading ability (RA) by presentations (linear)	557.23	1	557.23	1.72	
Sex by presentations (linear)	396.04	1	396.04	1.22	
Sex by RA by presentations (linear)	1.43	1	1.43		
Presentations by subjects within groups (Linear)	3885.87	12	323.82		

Table A9.14. Variance of Linear Trend. Total Study and Inspection Time. Successive Presentations. Three Treatment Groups. High and Low Reading Ability (RA) boys.

	Variance Estimate	F	p
Relevant Active Questions			
High RA boys	61.26	6.29	<.05
Low RA boys	15.54	1.59	.25
Active Questions			
High RA boys	35.70	3.67	.10
Low RA boys	54.18	5.57	<.05
Provided Questions			
High RA boys	103.21	10.61	<.01
Low RA boys	97.26	9.29	<.01

Note: Time in units of ½ minute. Overall mean = 10.22 units, *i.e.* 5.11 minutes.

Table A9.15. Variance of Linear Trend. Total Study and Inspection Time. Successive Presentations. Relevant Active Questions Group. High and Low RA boys and girls.

	Variance Estimate	F	p
High Reading Ability			
Boys	2156.17	6.64	<.05
Girls	4243.21	13.13	<.01
Low Reading Ability			
Boys	468.01	1.44	.25
Girls	1825.80	5.64	<.05

Note: Time in units of 5 secs. Overall mean = 54.33 units, *i.e.* 45.3 mins.

Each of the treatment groups had a writing task. For both of the Active Questions Groups, subjects had to write their own questions. The Provided Questions Group wrote answers to questions. When mean time spent on this writing task by the Provided Questions Group was compared by t-test (Table A9.16) with that for the other treatment groups, it was found that the difference favoured the Provided Questions treatment for High Ability boys ($p < .001$) and girls ($p < .01$), and Low Ability girls ($p < .05$). The difference for Low Ability boys was not significant.

Table A9.16. Mean Writing Time (in minutes) for Provided Questions Compared with Other Questions Groups for High and Low Reading Ability (RA) Boys and Girls.

	Group Treatment					
Subjects	Provided Questions		Active and Relevant Active Questions			
	Mean	SD	Mean	SD	t	p
High RA						
Boys	21.57	4.56	9.53	3.95	4.74	<.001
Girls	19.92	4.92	13.51	2.40	3.11	=.01
Low RA						
Boys	18.19	4.59	16.14	4.61		
Girls	19.69	5.25	11.25	4.64	2.79	<.05

QAR	Relevant Active Questions
QA	Active Questions
QP	Provided Questions

(iii) Number of Questions Asked

Analysis of variance did not indicate significant effects for treatments, but a highly significant Sex by Reading Ability interaction occurred; and the treatments by Reading Ability interaction almost reached an acceptable level of significance (F = 3.95, df 1.24, $p < .1$).

With regard to the Sex by Reading Ability interaction, comparison of means (Table A9.17) shows that whereas High Ability girls asked more questions than Low Ability girls ($p < .01$), Low Ability boys asked more questions than High Ability boys ($p < .05$).

Table A9.17. Mean Number of Questions Asked by High and Low Reading Ability Boys and Girls, ignoring Treatment Groups

	Reading Ability			
	High	Low	t	p
Boys	4.43	5.44	2.41	.05
Girls	5.69	4.31	3.36	.01

Table A9.18. Analysis of Variance of Number of Questions Asked in Relevant Active Questions and Active Questions Groups of High and Low Reading Ability, Boys and Girls.

	Sum of Squares	df	Mean Square	F	p
Reading ability (RA)	0.26	1	0.26	–	
Treatments	0.31	1	0.31	–	
Sex	0.03	1	0.03	–	
Treatments by RA	2.65	1	2.65	3.95	<.10
Sex by RA	11.48	1	11.48	17.13	<.001
Treatments by Sex	0.18	1	0.18	–	
Treatments by RA by Sex	1.19	1	1.19	1.77	
Within cell	16.26	24	16.26	–	
Total	32.36	31	32.36	–	

Square root transformations used

With regard to the treatments by reading ability interaction, comparison of means shows that whereas Low Ability subjects asked more questions under the Relevant Active Questions treatment (p <.01), High Ability subjects asked slightly more questions under the Active Questions treatment. The difference in their case was not significant, and was more pronounced for boys.

Table A9.19. Mean Number of Questions Asked (square root transformations) by Relevant Active Questions and Active Questions Groups, High and Low Reading Ability, Boys and Girls.

	Relevant Active Questions	Active Questions	t	p
Overall	5.06	4.86		
High Reading Ability	4.87	5.24		
Low Reading Ability	5.26	4.49	1.88	<.10
Boys	4.96	4.91		
Girls	5.17	4.82		
High Reading Ability				
Boys	3.97	4.88	1.57	<.20
Girls	5.76	5.61		
Low Reading Ability				
Boys	5.95	4.93	1.76	<.10
Girls	4.57	4.04		

Means are tested against the within cell term of the analysis of variance.

There was a significant correlation (Table A9.19) between number of questions asked by subjects in both the Active Questions Groups ($p < .01$). When High and Low Reading Ability subjects were considered separately, and the two questions groups taken together, it was found that the correlation between number of questions asked and scores obtained was significant ($p < .01$) for Low Ability subjects, but not for High Ability subjects. (Table A9.20).

Table A9.20. Correlations between Number of Questions Asked and scores obtained by Active Questions Groups, High and Low Reading Ability Subjects.

	r	p
Relevant Active Questions Group	.67	.01
Active Questions Group	.67	.01
High Reading Ability Group	.45	
Low Reading Ability Group	.65	.01

N = 16 for each r

CHAPTER 10 CAVEATS, CONCLUSIONS AND CONCERNS

10.1 CAVEATS: GENERAL AND METHODOLOGICAL
10.1.1. Off-the-cuff comments
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10.2 CONCLUSIONS
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10.3. CONCERNS
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CHAPTER 10

CAVEATS, CONCLUSIONS AND CONCERNS

10.1. Caveats: General and Methodological

10.1.1. Off-the-cuff Comments

In the course of investigations such as ours we were sure to notice features of the behaviour of children that were not immediately relevant to the focus of our enquiries. Some of these are worth mentioning, however, because they are relevant to children's learning.

Several can be captured in a caricature which would note that for many children school learning consists of being able to give those single answers to questions posed by teachers that will satisfy teachers.

That our research seldom required single right answers helps to highlight the general concern of children with answers rather than questions. When we asked children how they would find out something they did not know, they were distressed that they did not already know the answers (Chapter 7). Similarly, the cheating reported later in the chapter was geared to getting the answers right. The children were not enthusiastic about developing efficient search strategies, nor did they appear to derive any satisfaction from knowing or thinking up ways of finding out.

It is easy to see how such attitudes might develop. After all, most classroom initiatives come from the teacher, most questions come from the teacher (see Sinclair, Coulthard, and Doughty, 1972, for a review of relevant studies). Children are socialised into a passive role. For many of the questions directly posed by the teacher there are likely to be single, right answers. Teachers make frequent use of closed questions and those to which one word replies suffice. While it is necessary to check that learning is taking place and while it is also necessary to encourage a convergent approach to the acquisition of knowledge, it is to be regretted if the giving of right answers is all that is encouraged. It must be remembered that problem-solving involves task definition, analysis, processing, synthesis, and that answers to clearly formulated questions are only a small part of this activity. Knowing which questions to pose is a necessary condition of ultimate success.

That our children generally did not view such skills as valuable knowledge is unfortunate. Confronted with our materials they could generate questions, but they did not see this an achievement. They did not appear to think in terms of questions good and bad, important and trivial, efficient and inefficient (or even interesting and boring?). They wanted to apply or have us apply judgements of correct and incorrect, right or wrong. It seems to be items that can be so evaluated that are important to them. Questions are not answers and it is answers that count!

The educational implications of this problem are discuss later, but we can mention briefly the methodological difficulties arising. Investigations into questions that children ask are intrinsically strange enquiries to conduct because the respondents are being asked to do something odd. Questions follow answers, not questions. Questions arise from conflict and are intended to evoke a reaction. Yet we ask what questions children have. The activity they are now to engage in is not seen by them as having any value. It is pointless. Investigations that require subjects to make pointless responses which they are unable to evaluate are not likely to yield useful results.

Associated with the 'only-one-answer' mentality was a general absence of 'don't know' responses. Children seemed to be generally unwilling or unable to concede ignorance; they chose to guess. An unwillingness to concede ignorance is an unfortunate fault all too prevalent in our society, and we can see how it might interfere with learning, especially when one comes to fool oneself as well as others, but an inability to distinguish what one knows from what one does not know seemed particularly dangerous. There is no need to complicate the issue with a lengthy philosophical digression into epistemology. We are all aware that some of our pretended knowledge is mistaken. Also we know things that we do not know that we know. Much of our purported knowledge is messy in that we are not really sure of its status. However, there are things we are sure we know and others of which we are sure we are ignorant. Curiosity arises at the borders between the two. We can only be curious when we are aware of particular ignorance in a framework of knowledge. Questions locate gaps in knowledge; it therefore follows that where the contrast between knowledge and ignorance becomes too blurred, neither curiosity nor questions can arise. No one can acquire knowledge unless he has criteria for discriminating knowledge from ignorance.

This is why we were worried about 'knowledge' linked primarily to the judgements of authority rather than to personal conviction. Ideally, both conditions should be met. Teachers should be seen as credible sources of knowledge, but their authority should be in being correct and not in status.

The casual conversations at clubs and on courses (Chapter 4) uncovered examples where children had 'rejected' their own beliefs in favour of the beliefs of teachers, but where the teachers had proved subsequently to be wrong. There are two disturbing aspects to this. The first is that the original disagreements about matters of facts were not resolved by the teachers making an appeal to other sources of evidence. The second is that in the end the teachers suffered a loss of credibility. If they are dogmatically wrong about the date of Malplaquet who knows what else of what they say is untrue?

We also observed occasions where teachers would solicit answers from children but only allow as correct that answer which they already had in mind. Other sensible and correct answers were acknowledged but deflected or quickly negated. Where recordings had been made, teachers were quick to spot what was happening, disturbed, and resolved to take appropriate action. (Remembering the parable about motes in eyes, I was promptly able to diagnose exactly the same egocentrism as a pervasive characteristic of my own teaching. Occasional tape-recordings of one's lessons are a salutory source of reminders about unintended limitations). Both these styles of behaviour fit the model of response-based learning mentioned earlier (Chapter 2.6 and 2.7).

In Chapter 4 we examined some consequences of attendance at various courses. The suggestion that we evaluate the success of the Cross-cultural Week-end was welcome and the results showed measurable changes. The question that has to be posed, however, is why so few courses are evaluated. If courses are arranged there are presumably objectives in mind – or there should be. Means are chosen to achieve these ends. Are they satisfactory? Could they be substantially improved upon? These are empirical questions that should be answered if we are to advance beyond the appearance of doing something of educational benefit to the reality of doing so. Not only should such procedures facilitate improvements in courses, they should oblige organisers to think clearly about what it is they are trying to achieve.

Brief reports properly written up could be used by other teachers and LEA's considering similar ventures. There could be a growth of knowledge and expertise periodically checked against what actually happens to the consuming pupils. Reports could be filed both locally by Teachers' Centres or LEA's and centrally by such bodies as the Schools Council?

These suggestions should not be taken to presume an obsession with evaluation. Clearly evaluative procedures could be bureaucratized to such an extent that the courses themselves might be rendered absurd. It is a plea, not for an epidemic, but for a serious attempt to check the actual value of course attendance. Neither should it be presumed that children should be asked how many new friends they made, whether they enjoyed the party or how much more confident they now feel – on a seven point scale. There is experience and enjoyment to be had which would be diminished by probing interviews and insistent questionnaires. But if courses have specifiable aims whose attainment can be measured without undue interference in the courses themselves, there should be some occasional check on their success.

10.1.2. Questions: sincere and simulated

The failure to construct cunning techniques for experimentally tapping genuine questions may have been the big failure of the project. Or was it simply a misguided aspiration? We can note several points in favour of the preferable interpretation.

Given that the interest was in questions as an expression of curiosity, then, if the dynamics of curiosity and boredom are reasonably represented in Figure 2.2. and if the list of functions of questions set out in Table 2.1. has a measure of validity, we can rest assured that the simplest approaches to the problem of eliciting genuine questions must fail. That no questions are evoked in a situation may mean that there is no curiosity, but it could mean that other means of satisfying it are preferred. If questions are elicited, they may be fulfilling any one of a number of functions. This lack of reciprocal implication between the two justified the switch to the analysis of boredom in Chapter 5. At least the presence of boredom could be argued to be a reasonable ground for expecting an absence of questions.

We have argued, particularly in chapter 6, that some of the questions we obtained may have been more an expression of conformity to norms, of a willingness to play the role of helpful pupil, or of a calculated minimisation-of-trouble strategy than of any wish to fill gaps in knowledge. It might be argued that this may be true but derives from our simple-minded methodology. Questions are usually spoken not written. They are posed in individual rather than group settings. They are occasioned by a confrontation with something enigmatic, often particular and concrete. They are not often provoked by the abrupt presentation in verbal uniform of an abstract general concept like 'The Police'. Questions asked are normally answered immediately rather than later and are a part of a continuing dialogue. All these points have force. Taking note of them complicates procedures, but might help.

We could have followed children about trying to remain unobtrusive. Duffy played such a role in the Youth Club, but in eighteen months heard no questions of any interest; adolescents just did not ask knowledge-seeking questions. To have played a similar role within the confines of school might have been informative, but at school children are 'pupils'. They know what is role appropriate behaviour and can, if they choose, meet the expectations of teachers, asking questions when they judge it is right to do so and not asking them when they judge they should not. While our situations may be construed as requiring the children to play a role, we must not imagine that there are other situations where no role is being played. Different roles perhaps, but still roles. An ethological approach would have sacrificed the controls needed for comparisons to be made, but, if these comments are valid, they would have not necessarily provided any compensatory advantages.

We could have collected a series of objects or representations of events or of objects and shown or mentioned them to individuals in conversational settings in which the questions asked were answered. If we ignore the difficulties of projecting adolescents into a dialogue with a stranger, we would have still had two major difficulties to overcome. The answers given to questions would have acted to influence subsequent questions. Comparisons across individuals are immediately rendered awkward if not impossible. And once one child from a class has been seen, we are projected into the problem of at the least some leakage of information and hence a (continuously?) changing situation for subsequent interviewees.

We believed these difficulties would be exacerbated by the issues already mentioned about the pupils' wishes to perform well and get the answers right when this was impossible (10.1.1.).

Another possiblity would have been to have taken children into our confidence and said why we were interested in only their genuine questions. This was tried on one occasion, and the story told was greeted with devastated incredulity. 'You mean someone pays you to go round doing things like that?' 'It's crazy'. The perspective of the research worker was not one that the children found easy to appreciate.

In the last analysis the defence of our seemingly odd techniques would probably have to retreat behind the plea that there is something logically and psychologically silly about the idea of eliciting questions which are products of curiosity. Curiosity suggests spontaneity not contrivance; it is not amenable to tidy control. And if questions are expressions of curiosity they will demand immediate answers; they are themselves demands for responses.

These considerations may not be particularly serious either for theory or for educational practice. They do not and did not prevent us from examining competence at question-asking (Chapter 7), nor from finding out about who might be asked what (Chapter 8), nor from seeing what the utility of questions as stimuli for learning might be (Chapter 9). Enough studies have been done to enable us to tell a sensible story about curiosity, boredom and questions (Chapter 2).

In practical terms the important knowledge is not of what, but of how to find out! The idea that there are simple universal laws about what will stimulate curiosity in children would be a pernicious myth, if anyone were to believe it. We have argued that curiosity-provoking stimuli can only be defined in relational and not in categorical terms. What is enigmatic will always depend on the current state of the knowledge and interest of the perceiver.

What is important then is that teachers should see that any generalisations about categories of objects that will evoke inquiry by children have to be checked against the children. It is invaluable to have many 'rules of thumb' about the predominating interests of children of various ages, sexes, background, *etc.* It is foolhardy not to check the applicability of such generalisations to the particular children one is working with. Provided teachers have a range of materials and strategies for teaching specific problems and are willing to engage in a dialogue to establish the nature and value of what is to be learned, curiosity and boredom should be controllable. The principles as well as their practical realizations are the important features of the maintenance of interest.

10.1.3. Social Class Comparisons in Secondary Schools

The results of the locally conducted investigations into questioning led us to abandon social class comparisons and to adopt experimental studies at secondary schools in council estate catchment areas. We have mentioned some of the reasons for this switch (chapters 6 and 7). An oversimplified generalisation would claim that whereas the theoretically expected social class differences in questioning were generally established in primary schools, they were not in secondary schools. This could have been because early real differences have disappeared, or because methodological or technical oversights or impossibilities obscured their operation. Only the latter are mentioned in this section.

In the studies at secondary level we looked at class differences within schools, controlling for intelligence test scores. We could have ignored intelligence test scores, and we could have looked at differences across schools.

If we had looked at differences across schools we would have been open to the charge that any differences found were a function of school environments and not of social class. However, controlling for school leaves one open to the criticism that the samples of the social class groups will not be representativ. Ln the bilateral system of secondary education, the majority of working class, especially lower working class, pupils are in secondary modern schools and their grammar school social class peers are deviant. Only a small minority of middle class pupils are in secondary modern schools. While it is true that in the LEA in which most of the work was done had switched to a creamed neighbourhood comprehensive system, neighbourhoods are themselves class-linked. In the schools we used, the middle class were only very lightly represented. Even if there had been large comprehensives available, these would have most likely been streamed, with consequent variation in 'culture' of streams and the middle class pupils overrepresented at the top.

The research worker is duly impaled on the horns of a dilemma; whatever he does can be criticised. This suffering is partly a consequence of his own naivety, however. If the adult society is stratified in terms of class, itself heavily linked to occupation, and if occupations are linked to educational qualifications, it is absurd to expect this differentiation not to be strongly operative at secondary school. The differentiation has of course been present since birth (and before!), but by late secondary education it must be generally complete. The children are about to have their own social class rather than that of their parents! The dilemma is thus to be avoided by being careful about the research questions one poses in the first place. It can possibly be escaped by sacrificing certain constraints or occasionally using large samples. The smaller the sample the more likely it is to be 'deviant' in some way. If one moves to the level of a national sample, one can at least say what is happening in the society as a whole — as we did in Chapter 5.

Controlling or not controlling for intelligence test scores is but a special case of the problem. We know such scores are not culture free (Vernon, 1969). We know that within unknown limits, they can be changed. We know there is something wrongheaded about the heredity environment controversy (Eysenck, 1971; Jensen, 1969; Hunt, 1968; Robinson, 1973a). On the other hand, psychology would be poorer if it did not entertain a concept of 'intelligence' conceived as wholly inherited potential (see Butcher, 1968; Hebb, 1958).

There are cases where it is appropriate to control for intelligence test scores. One would be where differential 'intelligence' indexed by variations in scores could reasonably serve as an explanation for differences observed. If there is a wish to know whether an injection of nicotine affects rates of learning material, and we already know that IQ scores predict different learning rates, it may well be sensible to control for IQ across our injected and uninjected groups. On the other hand, if it was the relationship between nicotine injections and weight lifting that was of interest, such a control would be odd. In some situations rates and types of questions might well be a function of both 'immediate' intelligence and differential knowledge previously acquired through intelligence, but in others this would not be so. Given the definition of questions in terms of knowledge gaps, then relevant knowledge is a necessary condition of gaps being present and some measure of 'intelligence' must have been a determinant of the acquisition of that knowledge. However, our evidence shows, for example, that twelve year old pupils of 'average' intelligence should be as well equipped as those of 'high' intelligence to ask questions about many topics. It is difficult to see how differences in rates of questioning could be explained in terms of intelligence. How often do we say that someone is curious or interested because he is intelligent?

Developmentally, we would expect initial mastery of questioning skills to be linked to intelligence. In so far as there is a developmental sequence, more intelligent children should move faster through it, but once a skill is thoroughly mastered, differences in its utilisation are unlikely to be a function of intelligence. It is difficult to see why this point has not been argued before — any criticism of a study that has failed to control for 'intelligence' needs to show how the variation found would be explained by the invocation of differential intelligence. 'Intelligence' must be unpacked in terms of operations and not waved as a magic wand. We have frequently controlled for intelligence test scores, partly because the mastery of the language skills under examination is likely to be related to intelligence developmentally, and partly to disarm the critics. It is occasionally desirable to stack the cards against oneself in order to meet criticism on its home ground.

As a final point, it may be as well to note IQ's of 100 at different ages are only comparable in limited aspects. To obtain a score of 100 at fourteen should require greater intelligence than to obtain a score of 100 at age ten. The identity is relational only within an age cohort. Absolutely, knowledge and abilities increase with age, a feature fully explicit in Piaget's theory, but heavily neglected in the individual differences tradition that arose after Simon and Binet switched from thinking to pragmatism.

In practical terms this means that studies of social class comparisons with a developmental interest should normally include at least two age groups, and possibly more than one IQ group. (Ideally the lower IQ older age group should have the same *operational* intelligence as that of the higher younger group.)

The use of such designs should help to sort out what is substantively related to the behaviour being studied from what is only accidentally associated. We did not realise the advantages of the three way contrast until too late.

In any case the isolated excursion into training children (Chapter 7.5) should serve as a warning to those who place too much weight on present performance as an index of actual capacity. A brief set of guiding instructions was sufficient to enable a low IQ group to behave like a high IQ group. Although it would be silly to place too much faith in this instance, it is quite possible that the questioning and problem-solving skills of all children could be rapidly improved if deliberately taught.

10.2 Conclusions

10.2.1 The Dynamics of Curiosity and Boredom

By the end of chapter 2 we had refined Berlyne's analysis of curiosity and boredom into a general model of human behaviour which sought to represent the antecedents and consequences of these states and in particular to show the conditions under which learning might be expected to occur. This model was subsequently set in a more general framework of child development that articulated the ideas and evidence of the cognitive developmental and reinforcement principles approaches. We tried to show how the ideas of Piaget, Skinner and Bernstein would be combined.

We were subsequently able to examine and elaborate upon certain features of this perspective. We did not find it necessary to make serious amendments or reject it.

Duffy's analysis of the relationships between interest and perceived value and surprisingness on the one hand and between interest and questions and learning on the other were consistent with model of the dynamics of curiosity advanced (Chapter 3). More messy field investigations (Chapter 4) were likewise supportive viz a viz curiosity, although questions asked failed to relate to other variables. In the study of mother-child exchanges we failed to find the expected depressed rate of questioning in working class children, but the results linking the rates of child questioning and answering to the mothers' provision of cognitive meaning and her corrective and encouragement tactics provided strong evidence for utility of the model advanced. Likewise with the correlates of boredom in Chapter 5. Lack of parental interest and example, lack of teacher interest, poor academic performance, along with aggressiveness, withdrawal, truancy, early leaving and general disenchantment with school all fitted into a self-perpetuating boredom cycle. We have already issued caveats about the questions analysed in Chapter 6.

Questions are the weak point in the cycle, but we have indicated why this would be expected to be the case and will be returning to the issue later.

10.2.2 Social Class in relation to Boredom, Curiosity and Questioning

We assumed that children develop their knowledge through the interaction with the environment that Piagetian theory cites as necessary and sufficient. We argued that chronic failures by socializing agents to make optimal learning conditions available to children should retard this development. We further suggested that frequent, non-reward or actual punishment applied to attempts to find things out would lead to a regression or suppression of such efforts. These views are given particular expression in Bernstein's attempts to describe and explain social class differences in socialization practices. Bernstein drew attention particularly to the differential use of language by members of the middle and lower working class. If Bernstein is correct we would expect questioning among lower working class children to become particularly suppressed. Such children should lack the knowledge to serve as a springboard for questions, they should be less concerned about ignorance, less skilled in the formulation of their questions and less concerned about the sense and truth of the answers received.

Our evidence on boredom with school subjects showed this state to be strongly associated with social class. Further, the big differences were between the lower working class and the remainder, just as Bernstein would have to maintain. That social class is the sociologically important locating factor is shown by the relative failure of boredom to relate to income.

If we were to treat the rate of questioning as an index of curiosity, however, we would have to reject the theoretical premisses. We were able to show class differences in maternal interaction with their children, consistent both with findings of previous research (*e.g.* Hess and Shipman, 1967; Robinson, 1973b) and with Bernstein's particular theory and the more general reinforcement principles approach (Chapter 4). Further, individual differences in maternal behaviour both within and across social class were empirically associated with children's rates of questioning to a particularly strong degree. Social class differences in types of question produced by children were consistent with the general story both in six year olds (Chapter 4) and more weakly in fourteen year old adolescents (Chapter 6).

It would be rash to throw away the theoretical model because the upper, rather than lower, working class children in one study failed to show up one contrast expected on one index of questioning.

However, contrasts in rates of questioning to pictures in seven year olds (Heber, see Chapter 7), to verbally presented topics in fourteen year olds (Chapter 6), in two versions of 'Twenty Questions' and to incongruous cartoons (Chapter 7) also failed to yield differences. In each case we had some grounds for being wary of the results – cheating, difficulty in selecting and possible deviance of samples, strangeness of testing materials and conditions – but suspicion needs to be followed by clarifying evidence. While we judge it better to retain a faith in the idea that conditions of administration did reduce the chances of finding differences in sincere questions and can obtain some comfort from supportive evidence, we are obliged to defer any firm decision. If a sample contrasted on social class gave the same no difference in one of the situations above, but carefully observed natural rates of questioning differed there would be support for the original position. If we could show that lower working class adolescents are generally 'cooperative' in experimental situations and in particular could show that their questions contain a higher proportion of 'insincere' ones, the original story would be supported. Wootton in Aberdeen (1974) has found class differences in the spontaneous questioning rates of a small number of four year olds recorded in natural settings.

Other possibilities should be mentioned. Perhaps the initial variation in treatment of questioning by mothers of different social class is insufficient to depress the vigour of the push to resolve cognitive conflict alleged to be underlying intellectual development. This is rendered unlikely because we were able to show strong associations between the behaviour of mothers and children within class. It is unnecessary to argue that schools revive the curiosity of lower working class children, since we have failed to find differences before the children go to school.

Alas, there is also the possibility that the schools (or life experiences generally) erode or supplant the curiosity of middle class children. In Chapter 2 (section 7.3) we argued the case that middle class children could become switched into schedules of reinforcement that encourage them to pursue response-based, coming-top, examination success directed learning. Middle class adolescents, may be much too busy filling their heads with examination material to have time to be curious. Certainly the creme de la creme at the universities do not appear to be overwhelmed by a hunger and thirst after understanding. A degree is more likely to be described as a meal-ticket. It was a saddening experience to be told by an undergraduate that I had been mean to arouse his curiosity in a problem when I knew he had no time to follow up any interests he might have. Nobody seems to have given very serious thought to the possibility that the competition in secondary and tertiary education has been intensified in recent years to such an extent that we may be reaching a counter-productive state. The losers are bored and escape. A small but significant proportion of the potential winners 'drop-out'. Many of those who are able and willing to stay in the competition may have been reduced to sponges. They remain capable of absorption, capable of releasing most of what has been absorbed if squeezed hard enough at examinations, but are then left empty. Active enthusiasm for knowledge and understanding has disappeared. Adaptive problem-solving skills have never been encouraged to develop into the systematic efficiency portrayed in Piaget's concept of the formal operational thinker.

10.3 CONCERNS

The last paragraph might be seen as a flexing up of the emotional muscles in preparation for an apocalyptic frenzy. It will be helpful, however, to focus back on questioning and curiosity rather than to launch out into wider questions of the directions in which education is moving. What might be done to what ends to harness questions to facilitate learning, to improve questioning skills and to encourage curiosity and reduce the boredom of school children?

Prosser has already summarised the educational implications of his experiments into questions as an aid to learning (Chapter 9.3), and here we need do no more than remind ourselves of two main points. The efficacy of encouraging or providing questions was a *relational* and not a categorical problem, being unnecessary when material was very easy and irrelevant when it was too difficult. Hopefully, classroom occasions of the latter are kept to a minimum, but this will not be so for the former. Once children have grasped concepts and are required to learn items under a heading they understand, *e.g.* German strong verbs, the counties of England, or the school rules, questions will not differ from other attention maintaining rehearsal-encouraging devices in their power to aid learning. It is at intermediate levels of difficulty that questions are of use, and we must note that although pupils' own questions had no short-term advantage over questions provided externally, in the long-term they were equally beneficial. In so far then as it is better that children develop an independent mastery of teaching themselves, we could argue that children's own questions as aids to learning be preferred, where this is both possible and sensible in terms of conditions and materials.

10.3.1 Questioning Skills

We have seen that elementary questioning commences with the beginnings of speech. By the time children enter school, most of them will have mastered the grammatical rules for generating well-formed questions. What is still relatively weak is the knowledge of when to ask the right question to gain the sort of answer required. Clearly, it would be sensible to check that children at school have attained mastery of question forms. Tests such as that of Bellugi (see Robinson & Rackstraw, in prep.) might well be given and elaborated on and subsequent instruction geared to tidying up outstanding deficiencies.

Heber's data showing that the questions of middle class children are more likely to be complex and conceptual and Arnold's (Chapter 4) and Prosser's (Chapter 6) similar differences are presumably not peculiar to questions per se, but to language mastery in general.

Both Rackstraw's and Freeman's data (Chapter 7) revealed a lower working class deficit in generating questions to fit answers, which is not wholly unexpected in view of the earlier results which showed a higher incidence of answers irrelevant to questions in lower working class children. That Freeman was able to show that complete mastery was still absent or fourteen is alarming in that improvement seems not to have occurred in the interim. It should not be difficult to teach children of eight or nine which kind of answer goes with which kind of question and what the options are when they are available. The teaching of this knowledge could rely on not over-exciting exercises such as those used to probe the children's skills; it could be made more 'realistic' by showing breakdowns in communication as a result of misunderstandings arising from the posing of faulty questions or the provision of faulty answers. We were able to improve skills in the understanding of question-answer relationships very quickly using an artful puppet (Robinson and Rackstraw, in prep.).

Just as the question-answer links of working class children were less well established than could be rapidly achieved, so were their interrogatory skills in 'Twenty Questions'. As Duffy pointed out (Chapter 7) the fourteen year olds did not maintain any strategy that they initially assumed, especially in the face of 'No' answers. It should be remembered that with a finite set of alternatives and an ideal question a 'No' answer is as informative as a 'Yes'. There would seem to be no reason why adolescents should not learn of the different strategies, their advantages and disadvantages and their strength and weaknesses along the lines set out by Bruner, Goodnow and Austin (1956). Alternatively they could be taught the logic of scientific experimentation as set out by Inhelder and Piaget (1969). . If they are capable of formal operational thinking, why cannot the characteristics of such thinking be made explicit to them?

We have already mentioned the importance of these systematic strategies of interrogation for diagnosis of all manner of real-life problems. If Plowden's hope for the emergence of adaptive general problem solvers is to be realised, it might be sensible to teach the skills involved directly rather than to wait for them to emerge.

The apparent difficulty experienced in the handling of information in a negative form has been explored by Wason and Johnson-Laird (1972), another useful reference of relevance to teaching children how to solve problems. We should not forget that 'questioning' is only one way of trying to solve problems and our pilot work on different ways of finding out (Chapter 7) suggests that this too is an area where lower working class children are weak on range and utility.

10.3.2 Opportunities to Ask Questions

In Chapter 4 we reported upon two aspects of the questioning sessions which had become an institutionalised intermittent feature of science lessons in a secondary school. In Chapter 8 Creed showed how children's selection of preferred answerers became more differentiated with increasing maturity. For teachers this was related to their approachability as well as to their perceived expertise. We were not concerned with individual counselling on personal problems, but would draw attention to the possibility that the procedures used in the public question sessions have some advantages over individual private interviews. Interviews may be private, but they are not anonymous. In counselling the interviewee has to talk about embarassing matters in the presence of a person whose reactions are unpredictable. The written slips, especially if the note is written for or by a 'friend' confers an anonymity upon the questioner in much the same way as is achieved in 'Problem Corners' of teenage magazines, but without the complications of writing in. The teacher in charge of science said that it was not uncommon for important personal difficulties, of which he was aware from other sources, to be asked about in the relaxed informality of the question session. As our special analysis of questions about sexual behaviour showed, an established routine sensibly handled did not result in larking about; almost all questions were serious and sensible. Again, the teacher in charge was able to point out that what might appear to be a facetious or cheeky inquiry may in reality be deadly serious. We are prone to judge in the light of our knowledge rather than the children's ignorance. Many of us can probably recall incidents at school where perfectly serious answers from pupils were pounced on an insubordinate. We can probably also recall some very professional acting as well.

Creed's results can however, be used to argue the case for the occasional availability of individual consultations arranged so as to allow child-teacher interaction without the pupil having to break peer-group norms. His results also showed that teachers' attitudes to teaching were effective predictors of a willingness to ask questions, whereas experience and personality per se were not. Child-centred concerns and a liberal control policy were associated with pupils' preferences.

To put on question sessions might in itself constitute grounds for pupils' seeing a teacher as child-centred! But are these sessions worth institutionalizing? They are certainly worth trying both for specific and general matters and like all puddings the eating should be informative.

Their enactment does imply a concern to teach what children want or think they want to know, as well as to teach them what we think they need to know. Pupils are apparently able to store up questions that occur for handing in at a future date. Teachers could help by having Question Boxes opened fortnightly on Thursday afternoons. If some similar system were used sensibly, it could help to meet a number of the moans made by the 'bored'. The bored should see their own questions as relating to useful rather than to useless knowledge. Boxes and sessions indicate that teachers are interested in their pupils and willing to treat them as responsible. A little variety is added to the perceived day-to-day sameness.

Additionally, the questions give teachers an opportunity to admit to the limitations of their own immediately available knowledge, a useful means of enhancing credibility and authoritativeness. Nothing diminishes authority as much as being wrong, yet unable or unwilling to admit it.

There is no reason why teachers should actually provide answers to all questions asked. Other pupils may know answers. These answers might differ. Ways of finding out could be discussed. These could be acted upon and evaluated. It might even be found that several ways and several answers were all sensible.

Questions either specific and general are a useful source of information for teachers both for them to ascertain where the boundaries of knowledge and ignorance are located and what the interests of their pupils are. Teachers may be surprised at the extent of the differences between what is the case and what they believe to be the case. With one study group we recorded small discussion groups of pupils with teachers, without teachers and ordinary lessons. The topics were particular poems. What surprised the teachers was the discrepancy between their expectations and what the pupils actually said when alone. The teachers focused on the insights and aesthetic qualities of the poem and how these were expressed through the linguistic units and structures. The children asked each other what words and clauses meant, happily commenting on the absurdity of the metaphors they were interpreting literally. Odd references to links between events in the poems and their own experience mingled with criticism of the poets' ignorance of basic grammar. 'You can't start a sentence with 'And'.' The questions the children asked revealed the great gap between where they were and the lessons given.

10.3.3 Boredom

The difficulties schools experience lie partly in the diversity of the functions they are expected to perform, and in the lack of a systematic analysis of the relationships between these functions and the structures and resources available for realising them. Prisons are a sad and inconsistent mixture of punishment, reform, deterrence and the protection of society's members, muddling along in a mess. Schools are expected to prepare children for the next stage in education or life, to socialize children into good citizenship, to categorize and select children for different schools and to diagnose and attend to welfare problems as well as to encourage learning. We must perforce ignore all but the last but at least we can mention our sympathy with the complexities of the job of being a teacher.

Even within the last function the schools have to resolve a necessarily continuing dilemna. On the one hand they are required to transmit increasingly large quantities of the factual knowledge acquired by mankind, on the other they are enjoined to allow children the freedom to discover the secrets of the universe for themselves, interfering but minimally with this process. Regrettably and absurdly these extremes are set up as alternatives, in spite of the fact that the contrast confuses content and method. As we have argued earlier the decisions about method should be contingent upon prior decisions of what is to be learned. It is absurd to expect individual children to discover knowledge it has taken men thousands of years to accumulate. It is absurd to insist on rote learning of ununderstood concepts.

Likewise, in terms of content, we can see that adolescents who are simply mines of facts are as hapless as those who are adaptive general problem solvers with no facts on which to exercise their skills. 'Knowing that' and 'Knowing how' are complementary not antithetical. How much and what of which involves a complex value-judgement to be based on current and estimated future requirements of the members of a society.

Our immediate concern has been that 'knowing how' is undervalued and undertaught in the very general area of problem-solving, a concept that embraces all subjects in the curriculum. Skills in knowing how to find out answers to questions and skills at formulating questions are sadly neglected. But the development of these skills in a vacuum would be even more silly than teaching children to read without them seeing any point in doing so! They can only sensibly be acquired if they are seen to be of use in solving problems children are interested in solving. This is not to say that the problems have to have only the attributes of value or relevance or the curiosity-arousing features of conflict mentioned in Chapters 2 and 3. But they will not be acquired if children are bored.

If nearly thirty per cent of secondary school children are bored by at least thirty per cent of the subjects they are studying in school, we have reason to be dissatisfied. The minority is too substantial to be ignored, and we have to ask ourselves what steps might be taken to improve morale. We suspect that the aspirations of the Plowden and, more particularly, the Newson reports have not yet been translated into practice and it is difficult to see why not. There may be a self-perpetuating boredom cycle like that represented in Fig. 5.1 and it may be endemic in the lower working class, but it does not have to be so. Both parents and pupils may see what goes on in the school as useless and irrelevant. They are unlikely to change their minds. The teachers may judge the situation to be hopeless. It is true that it is likely to be a slow and arduous task for them to change the situation, but they are the only force that can. We have suggested that if the curriculum in secondary schools were seen to be relevant and valuable, the pupils would learn. It would seem sensible to try to persuade the pupils that the curriculum is relevant and valuable. Why then do teachers not justify the curriculum? Do they think this unnecessary? Are they unwilling or unable? If it is argued that it is unnecessary, this is either an insult to the intelligence of maturing adolescents or a serious error of judgement. It would be insulting to the teachers to suggest they are unwilling. If they are unable, is this because they have not or are not taking steps to find out why the curriculum is as it is? Or is it that these steps have been taken and they themselves judge the curriculum to be of no value? If this last is true, how can pupils be expected to see the value of what they are required to learn if their teachers do not? It would not be surprising that classroom interaction degenerates into problems of control if no one present sees any purpose in any other activity.

We would suspect that the first and last reasons both have need to be investigated. It would be well worth examining the consequences of explaining the rationale of the syllabus to pupils. It is urgent to find out how many teachers are themselves unable to justify what they are teaching, and if it emerges as one might expect, then there will need to be some vigorous discussion and decisions, whose sense should be tested against the consumers' learning, until we arrive at curricula that re-engage the enthusiasm of the bored for knowledge. When teachers are convinced of the worth of what they are teaching, they are likely to be credible. If they are credible, the pupils should come to believe them. And when the pupils are persuaded of the value of the knowledge they are to acquire, they may strive to master it.

REFERENCES

Bruner, J.S., Goodnow, J.J. & Austin, J.A. *A study of thinking.* New York : Wiley, 1956.

Butcher, H.J. *Human intelligence.* London : Methuen, 1968.

Eysenck, H.J. *Race, intelligence and education.* London : Temple Smith, 1971.

Hebb, D.O. *A textbook of psychology.* Philadelphia : Saunders, 1958.

Hess, R.D. & Shipman, V.S. Cognitive elements in maternal behaviour. In J.P. Hill (ed.) *Minnesota symposium on child psychology.* Minneapolis : University of Minnesota Press, 1967.

Hunt, J. McV. Has compensatory education failed? *Harvard Educ. Rev.,* Reprint Series No. 2, 1969.

Inhelder, B., & Piaget, J. *The growth of logical thinking.* New York: Basic Books, 1958.

Jensen, A.R. How much can be boost IQ and scholastic achievement? *Harvard Educ. Rev.,* Reprint Series No. 2, 1969.

Robinson, W.P. The dialogue of 'deficit' and 'difference' in language proficiency. *Intern. J. Psycholinguistics,* 1973a, *1,* 1 – 13.

Robinson, W.P. Where do children's answers come from? In B. Bernstein, (ed.) *Class, codes and control. Vol. II.* London : Routledge, 1973b.

Robinson, W.P. & Rackstraw, S.J. *A question of answers.* London : Routledge, 1972.

Robinson, W.P. & Rackstraw, S.J. Questioning and answering in middle school children (in prep.)

Sinclair, J. McH., Forsyth, I.J., Couthard, R.M. and Ashby, M. The English used by teachers and pupils. SSRC Report, 1972.

Wason, P.C. & Johnson-Laird, P.N. *The psychology of reasoning.* London : Batsford, 1972.

Wootton, A.J. Talk in the homes of young children. *Sociology,* 1974, in press.